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# THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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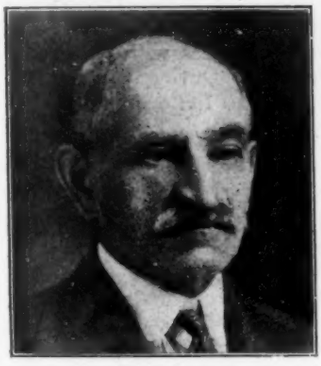
ELECTRO-PLATERS REVIEW.

Vol. 19 NEW YORK, JULY, 1921 No. 7

# American Electro-Platers' Society

## Ninth Annual Convention Held in Indianapolis, Ind., June 29 -- July 2

**Written for The Metal Industry by EARL BULLOCK**



PHILIP UHL,
National President

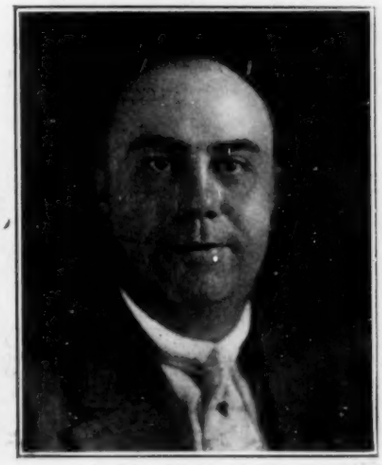
It may not have been the largest convention ever held by the organization, but from an educational standpoint, it could not be surpassed. From the first official meeting held the night of June 29 until the banquet the night of July 2 the Ninth Annual Convention of the American Electro-Platers' Society in Indianapolis was full of the very thing every convention of a business nature seeks, and so few have—something constructive to work on, during the whole time.

Before we go into the convention proper, it might be said of the Indianapolis branch members that the convention was run on the "cost plus" basis, if you get what is meant. A registration fee of six dollars was charged for men and four for women, which was designed to cover all the expenses. With each registration went all the necessary tickets and credentials incident to the convention, and on the last night a surprise was sprung by the Indianapolis men, namely the returning of two dollars to each registrant, something that is rarely done in conventions. At the banquet, each person who paid the fee found at his plate a little card, on which was his name and to which was attached the return money.

From an organization standpoint, most of the activity occurred in the last business session held July 2, at which time officers were elected and the convention city selected. Philip Uhl of Philadelphia was elected president. He was nominated by Walter Fraine, of Dayton. Mr. Uhl has been vice-president of the Supreme Society for four terms and has always taken an active part in organization work. Just before the convention proceeded with the election, President Sylvester Gartland appointed five of the Indianapolis branch as tellers, but there was nothing for them to do, since every man elected was elected unanimously and there was nothing to do but for the secretary to cast a unanimous ballot. Mr. Uhl made a nice little talk in which he accepted the honor and declared he would do all in his power to further the work of the organization. He is a charter member of the Philadelphia branch.

JOHN E. STERLING,
National Secretary

S. E. HEDDEN,
National 1st Vice-President



FRANK J. HANLON,
National 2nd Vice-President

S. E. Heddon, of the Pittsburgh branch was named first vice-president. He was nominated by E. J. Musick of St. Louis, after Mr. Musick had declined the nomination. Mr. Musick was nominated by Oscar E. Servis, of Chicago, a past supreme president, but said owing to the fact that he was an officer in thirteen other organizations, he felt it would be an imposition on the Elec-

tro-Platers' Society to name him. H. H. Williams, editor of the Monthly Review, nominated Frank J. Hanlon, of Chicago for second vice-president. George B. Hogaboom, a past president, nominated John E. Sterling, of the New York Branch, to succeed himself as secretary-treasurer. Mr. Servis named Walter J. Allen, of Grand Rapids, as editor of the Review to take the place of H. H. Williams, who announced during the first business session that he would not be a candidate for re-election.

W. J. ALLEN,
Editor, The Monthly Review

On a motion of Mr. Fraine the convention issued a vote of thanks to the outgoing officers for the work they have done during the year, and shortly afterward Cincinnati was voted as the next convention city, with notice filed by the Providence branch that it would be in the field for the 1923 convention. After a talk by a representative of the Cincinnati Chamber of Commerce, all invitations coming from cities having no branches were dropped and then all cities asking for the convention and not having delegates at the convention were dropped.

Secretary Sterling and others desired to have questionnaires sent out by the Supreme Society adopted by the branches generally. The questionnaires are used in passing on the qualifications of new applicants for membership. The idea was opposed from the floor and finally it was moved to refer it to the executive board for action.

Both the editor and the secretary-treasurer got increases in pay. Changes made now give the editor $150 a year and the secretary-treasurer half as much. It has developed that in a financial way the organization is in good shape and it was decided that some of the surplus money should be put to work, so provision was made for both a savings and checking account. The checking account shall be $500 and the remainder shall be deposited for interest drawing purposes. Mr. Sterling announced that he was devising ways and means for increasing the revenue of the organization through the sale of membership certificates, buttons, stationery of an official nature and other methods. These questions also were referred to the executive committee after they met with some opposition on the floor.

Felicitations of the convention were sent to "Daddy" Hale, who was unable to attend and a special committee on resolutions thanked the Indianapolis branch for the instructive convention and the entertainment features.

JUNE 29

Virtually all the day was give over to registration and getting acquainted. Delegates began arriving early in the morning and renewed acquaintances with some who had arrived the evening previous. During the day the delegates arrived on every train. In the evening a technical talk was given by Prof. Hiram S. Lukens, of the University of Pennsylvania.

JUNE 30

Early in the morning, almost before anybody was up the executive board and the credential committee met in the assembly hall in executive session and transacted routine business and passed on credentials that had been turned over the night before. Promptly at 9 o'clock the convention was called to order by Richard Hennes-

NINTH ANNUAL CONVENTION

sey, president of the Indianapolis branch, who "passed the buck" to President Sylvester Gartland.

In the absence of Mayor Charles A. Jewett, Walter R. Jarvis, head of the Recreation Department of the city, made the address of welcome. He turned over the mythical keys and promised the convention that at the picnic to be held the next day his department would provide balls and bats and other amusement paraphernalia. His offer was accepted gladly. He said each city should take more interest in park and playground improvements in order to build up city morale.

President Gartland in replying said the society accepted the hospitality of the city in the same spirit in which it was given and he felt sure a wonderful convention would be the result. He said the business depression no doubt was responsible for a rather depleted attendance.

Charles H. Proctor, of New York, Founder, stated in his address that it was up to the individual members of the organization to put more into their profession. He said electro-plating was an art and a science and the members of the society must get more and more into chemistry. He said spotting out must be solved and the problem of nickel plating zinc-coated steel must be solved. He declared solutions must be scientifically controlled. His prediction on general conditions was optimistic. He said business is recovering from the shock of last year and that before long he expected to see some readjustments made in foreign exchange.

Oscar E. Servis, of Chicago, also a past president, declared the cue of the electro-plater should be optimism. He said each member of the organization should take it upon himself to spread the doctrine of confidence and optimism. He said each man should do more to reduce costs in the plants and should give more study to his profession. He said the Society had no place for shrinkers, but needed workers.

H. H. Williams, editor of the Review, closed the morning program with a talk in which he announced that he would not be a candidate for re-election.

The afternoon and evening were given over entirely to technical papers and discussions.

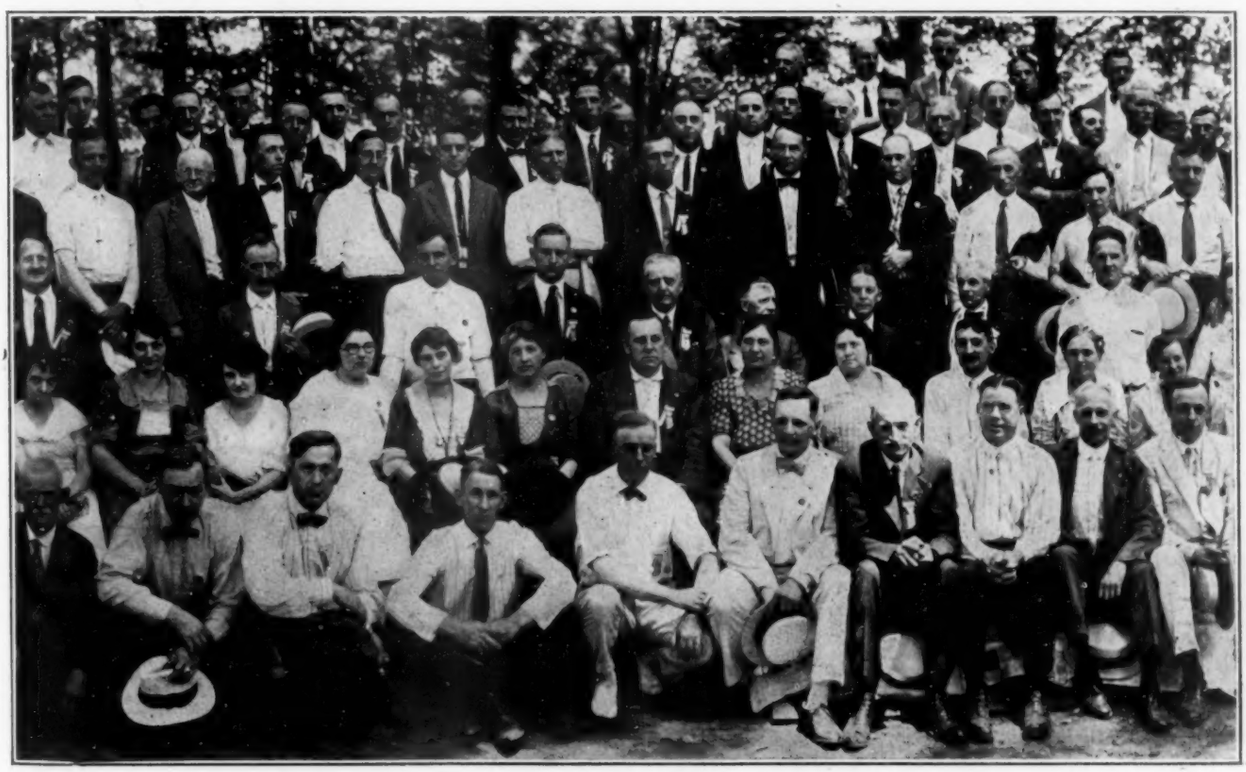
JULY 1

The day of the picnic and the ball game. Two special street cars were on hand at 8:15 o'clock in the morning to take the visitors to Columbia Park, south of the city, where a regular time was held. A short business session featured the morning program, during which papers were read and discussed. The afternoon was taken up mostly by the Eastern delegates in which they demonstrated decisively their superiority in the great national sport. The final score was 17 to 14 in favor of the East. Trumbour, who in spare moments does some work for THE METAL INDUSTRY, pitched for the East. His receiver was Jugle, of Jamestown, N. Y. Hazucha, of St. Louis, was the slab artist for the West and Lawrence of Chicago was on the receiving end. "Bill" Shakespeare's Comedy of Errors provided the general ground plan of the game, so that after nine innings the score and the errors just about balanced. The evening session consisted of technical papers and discussions.

However, Charles H. Proctor, the founder, found time to give a dinner at another hotel to members of the Past Presidents' Association. He was named chairman of the organization for the coming year. Those who attended were Richard H. Sliter, Jersey City; George B. Hogaboom, Newark; Walter S. Barrow, Toronto, Canada; H. H. Williams, St. Louis; Walter Fraine, Dayton; Oscar Servis, Chicago; Sylvester P. Gartland, Rochester, and Mr. Proctor. J. H. Hanjosten, of Chicago, was the only past president to be missing.

JULY 2.

The final business session was held in the morning, at which officers were elected. In the afternoon the entire



AMERICAN ELECTRO-PLATERS' SOCIETY

convention was taken on a sight-seeing tour of the city and made one complete circle of the famous Motor Speedway, where every Memorial day American and foreign cars vie with each other for honors in the 500 mile test. A dinner and dance in the evening, at which the new officers were installed, closed the convention.

The ladies were well taken care of. The first day they were taken on a shopping trip and in the evening to a theater party. The following morning a trip through the market house and a luncheon were given, and in the afternoon they visited the James Whitcomb Riley Memorial Library, the John Herron Art Institute and the Federal building where Judge Anderson holds court. The evening of July 1 another theater party was given and the following morning they were taken to the top of the Soldiers' and Sailors' monument.

Just to give some idea of the instructive features, papers were read as follows: "Organic Additions in Plating Solutions," by I. C. Wall; "The Future of Electro-Plating," by George B. Hogaboom; "Acidity of Nickel Solutions," by Dr. Blum; "Cyanide of Potassium vs. Sodium," by W. Huesing; "Monel Metal," by O. E. Servis; "Platers' Troubles," by H. Richards; "Spotting Out," by A. S. Thompson; "Plating Costs," W. J. Allen; "Series vs. Parallel," by Heil; "Electrolytic Reproduction of Plates," Dr. Blum; "Cyanide of Potassium," M. Huesing; "Acid Copper Solution and Method of Chemical Analysis," by O. J. Sizelove, and read by Mr. Hogaboom. The rapid fire discussions following each paper testified to the interest being taken in scientific research.

### EXHIBITS

A large number of exhibits were shown. Various finishes were exhibited by the following: The Quickmeal Stove Company, St. Louis; Ferd. Messmer Manufacturing Company, St. Louis; Charter Oak Stove and Range Company, St. Louis, Mo.; J. H. Hartman, of the St. Louis branch; Fred. Medart Company, St. Louis; Leedy Manufacturing Company, Indianapolis; American Slicing Machine Company, Chicago; Climax Machinery Company, Indianapolis; Wheeler-Schebeler Carburetor Company, Indianapolis; American Metal Furniture Company, Indianapolis; Indianapolis Plating Company, Indianapolis; Nordyke and Marmon, Indianapolis; Indianapolis Stove Company, Indianapolis; Dayton Plating and Manufacturing Company, Dayton; National Cash Register Company, Dayton; H. J. Ter Doest, Akron; Home Stove Company, Indianapolis; Standard Plating Works, Goshen, Ind.; Chicago Band Instrument Plating Company, Chicago; and Louis Schulte, Chicago.

Various plating supplies and aids were exhibited by the following concerns:

J. B. Ford Company, Wyandotte, Mich.; Wyandotte Cleaners.

International Chemical Company, Philadelphia; Metal Cleaners.

St. Louis Platers' Supply Company, St. Louis; Richards Buffs and Richards Rotary Plating Machine.

Oakley Chemical Company, New York, had a display in which was a piece of silver, the first ever cleaned with Oakite and plated by the International Silver Company.

W. E. Belke, Chicago, Ill.; Belke's Tank Filter.

A. P. Munning & Company, Matawan, N. J.—Quoit Anodes.

O. A. Servis, 5305 Warner avenue, Chicago, Ill.: Contact Hooks.

Celluloid Zapon Company, New York; Lacquers.

Maas and Waldstein Company, New York; Lacquers.

Crown Rheostat and Supply Company, Chicago; Rausch Agitator.

### OPINIONS OF THE CONVENTION

Richard Hennessey, president of the Indianapolis branch—The Indianapolis branch is sure glad we had the convention. We have been assured that the delegates

INDIANAPOLIS, IND., JUNE 29-JULY 2

had a good time and heard something instructive. While we were expecting more people, yet the fact that they did not get here did not detract in any way from the program, and some time when others have had their turn we want the convention again.

Sylvester Gartland, past president—Never have I heard better educational papers and heard livelier discussions. In spite of the warm weather and the rather small attendance, the convention was an exceptionally good one. The entertainment features for both men and women were good.

Charles H. Proctor, founder—Much credit is due the members of the Indianapolis branch for the wonderful convention. It is true the attendance was curtailed, but that did not detract from the convention in any serious measure. It has shown that the smaller organizations can handily take care of the convention. The organization of the Indianapolis branch could have handled twice the number without any inconvenience.

## How the East Won the Convention Ball Game

O, listen you platers and you shall hear
A story that sounds both strange and queer,

About our Annual Baseball Fest,
That happens each year 'tween the East and West.

'Twas at Indianapolis, first of July,
The Easterners had their annual try

The Western baseball team to beat,
The team which had never known defeat.

But the pitcher which goes to the well each day
Gets finally smashed, they always say.

Napoleon tried the whole world to subdue,
But he finally met his Waterloo.

The West always won when the runs were reckoned,
But this year they had to come in second.

Till the last man was out the battle raged,
And a batting rally the seventh staged,

But Trumbour's men could not be denied,
And fought back hard till the rally died.

The West made fourteen runs with the bat,
But the East made three more runs than that,

Though Rudy Hazucha, Babe Ruth is his name,
Batted 1,000 per cent in the game,

And Lawrence, Musick and Nikolas too,
And all the rest of the Western crew

Played hard the whole seven innings long,
The East was just a little too strong.

One incident looked to me rather queer,
When a New York man gave our players some beer.

Though fielder Terrio then went lame,
We admit defeat, we lost the game.

We congratulate Trumbour and all his crew,
But we'll make them play in '22. H. J. RICHARDS.

# Meeting of the American Society for Testing Materials

The annual meeting of the A. S. T. M. was held in Asbury Park, New Jersey, June 20-24. Papers of interest to the metal industries were as follows:

Report of Committee B-1 on copper wire, J. A. Capp, chairman.

Report of Committee B-2 on non-ferrous metals and alloys, Wm. Campbell, chairman.

Methods of casting manganese bronze test bars as a check on melts of small castings, E. H. Dix, Jr.

Some mechanical properties of hot-rolled monel metal, P. D. Merica, R. G. Waltenberg and A. S. McCabe.

The report of Committee B-2 was read by Dr. Merica in the absence of Dr. Campbell Ten sub-committee reports were submitted.

A summary of the work of Committee B-2 is as follows:

**Items**

TENTATIVE STANDARDS TO BE ADOPTED AS STANDARD

1. For Sheet High Brass (B. 36-20 T.).
2. For Bronze Bearing Metals for Turntables, etc. (B. 22-18 T.).
3. For Bronze Bearing Metals in Ingot Form (B. 31-19 T.).
4. For Solder Metal (B. 32-19 T.).
5. Methods for Chemical Analysis of Alloys of Lead, Tin, Antimony and Copper (B. 18-20 T.).
6. Light Aluminum Casting Alloys (B. 26-19 T.).

PROPOSED REVISIONS IN TENTATIVE STANDARDS

7. For Pig Lead (B. 29-20 T.).

PROPOSED NEW TENTATIVE STANDARDS

8. For Nickel (B. 38-21 T.).
9. Methods of Chemical Analysis of Aluminum and Light Aluminum Alloys (39-21 T.).
10. Methods of Chemical Analysis of Nickel (B. 40-21 T.).

The reports of the various sub-committees and of the committee as a whole were accepted. Copies of the various specifications and papers can be obtained from the secretary-treasurer of the A. S. T. M., 1315 Spruce street, Philadelphia, Pa.

The paper on methods of casting manganese test bars by Mr. Dix gave the results of a series of experiments made in the foundry of the Engineering Division of the Air Service at McCook Field, Dayton, Ohio, in an endeavor to fix upon a satisfactory method of casting separately test specimens of manganese bronze as a check upon the quality of small melts. An abstract of this paper will be found on page 294 of this issue.

### Cleaner

Trisodium phosphate alone can be used as a cleaner, but by adding caustic soda, aluminum sulphate, soda ash and rosin, the cleaner is improved. The rosin should be granulated. I have found the following proportions to be very suitable for the general run:

| | |
|---|---|
| Trisodium Phosphate | 3½ oz. |
| Caustic Soda | 1 oz. |
| Soda Ash | 2 oz. |
| Rosin (Granulated) | 1 oz. |
| Aluminum Sulphate | ½ oz. |
| Water | 1 gal. |

If used with a current, ½ oz./gal. of cyanide can also be added, although it is not really necessary. I find that the double throw switch is of great value where brass work is handled, as one very short reversal will usually remove the tarnish.—J. C. Singler, Cleveland Branch, in *The Monthly Review*, June, 1921.

# Wax and Wax Compounds

## A Summary of Methods of Making and Using Waxes

Written for The Metal Industry by SAMUEL WEIN

Wax and wax compounds are used extensively in the electroplating plant. Its uses are primarily for duplication of metallic surfaces, as a "stop off medium," and as a polishing compound.

The idea of wax in general according to Rogers (Manual of Industrial Chemistry), is based in a considerable measure on the physical characteristics of the oldest known wax, namely beeswax. It has been suggested that the term wax be defined as applied to more or less unctuous, fusible, variably viscous to solid substances, having a characteristic waxy luster, which are insoluble in water but usually soluble in carbon bisulphide, benzene, etc., which are extremely susceptible to changes in temperature and whose origin, composition and color are variable.

Thus under this definition are included the class of waxy compounds which consist of mono-or dihydric alcohols united with the higher fatty acids to form esters (beeswax, carnauba, etc.), as well as glycerides of a waxy appearance such as for example Japan wax and the hydrocarbon waxes, paraffin, ceresin, ozokerite and the like.

There are three sources of wax. These are animal (beeswax, spermaceti, stearic acid); vegetable (bayberry, candililla, carnauba, Japan); and mineral (ceresine, montan, ozokerite, paraffin). These waxes have various different characteristics, each of these waxes has of course a special use.

### ANIMAL WAXES

#### BEESWAX

**Origin:** Secreted by the honey bees in building up the comb. It is extracted from the comb by boiling it in water; the floating mass of brown or yellowish wax is drawn off and molded. In commerce it is found in two forms, the crude and the refined.

**Characteristics:** The hardness varies with the amount of impurities it contains. It melts at about 140° F. and is soluble in alcohol, ether, acetone and chloroform.

Beeswax is purified by dissolving it in any of the solvents already given and extracting the wax therefrom by distilling off the solvent. It is readily bleached by exposing it to the sunlight, or by the moderate action of chromic acid, nitric acid, or hydrogen peroxide. The bleached wax is white and is odorless and tasteless.

#### CHINESE INSECT WAX

**Origin:** The secretion of an insect inhabiting a variety of evergreen trees found in China.

**Characteristics:** Yellowish white in color and resembles spermacetti in appearance, though this wax is harder. It is soluble in alcohol, chloroform, benzol and naphtha and is odorless and tasteless. Its melting point is 176° to 177° F.

#### SPERMACETTI

**Origin:** It is found in the head cavity and in the blubber of the sperm whale.

**Characteristics:** It is sold in the form of solid and white and semi-white blocks; it is rather brittle and readily rubbed to a powder; its fracture is crystalline. It is soluble in ether, chloroform, carbon bisulphide and hot alcohol, it melts at 107° to 116° F. and is almost odorless and tasteless, becoming rancid on exposure.

#### STEARIC ACID

**Origin:** Extracted from the natural fats and oils by splitting, followed by cooling, pressing, distilling, etc.; and from oleic acid by hydrogenation.

**Characteristics:** Its chemical formula is $(CH_3CH_2)_{16}CO_2H$. It comes in the form of a hard, white, dense mass. It is sold in the form of "single pressed," "double pressed," and "triple pressed," indicating the degree of the extraction of the oleaginous matter. It is soluble in alcohol, ether, and sparingly in water. Its melting point is between 126° to 130° F.

### VEGETABLE WAX

#### BAYBERRY WAX

**Origin:** This is greenish wax derived from the berries of the bayberry, found in the Eastern territory of the United States.

**Characteristics:** It is a fragrant wax and of saponifiable value. The green color bleached to white. Its melting point is 102° to 109° F.

#### CANDILILLA WAX

**Origin:** This wax is found as a coating on the entire surface of a certain Mexican shrub called the candililla. It is extracted and refined by boiling it in steam tanks.

**Characteristics:** The impure wax is dark brown but the refined product is opaque to translucent with a brownish yellow color. It is harder than beeswax but not as hard as carnauba. Its melting point is 152° to 154° F.

#### JAPAN WAX

**Origin:** This wax is derived from hard white tallow-like mass which surrounds the kernels of the berries of several varieties of sumac trees found in Japan and China.

**Characteristics:** In commerce it is met in the form of a semi-plastic, pale yellowish or cream-colored mass. Its melting point is 118° to 127° F.

### MINERAL WAXES

#### MONTAN WAX

**Origin:** This is a hard wax obtained from the distillation of the lignites found in Saxony and Thuringia.

**Characteristics:** It is of an exceedingly friable nature and brown to dark brown in color. It dissolves in carbon tetrachloride, benzol, and chloroform. Its melting point is between 176° to 195° F. It is used as a substitute for carnauba.

#### OZOKERITE

**Origin:** A soft compound (also called earth wax), found in small quantities throughout the world, usually associated with rock salt or gypsum. The principal deposit occurs in the neighborhood of Borgslow in Galicia. It consists largely of solid paraffin hydro-carbons and is supposed to have resulted from the evaporation and decomposition of crude petroleum.

**Characteristics:** It occurs in several grades, some being soft and plastic and others brittle. The color ranges from a greenish brown to a black. It is soluble in benzine, benzol, turpentine, kerosene, ether, carbon bisulphide and slightly in alcohol. Its melting point is between 130° and 156° F.

CERESIN

**Origin:** A refined ozokerite. Ozokerite after treatment with sulphuric acid, washing and neutralization with caustic soda, is filtered through bone black or "Fullers earth."

**Characteristics:** An odorless and tasteless white wax, the coloring varying at times. The melting point is the same as ozokerite. It is soluble in alcohol, benzol, chloroform, and naphtha.

PARAFFIN

**Origin:** A translucent waxy material of laminocrystalline structure, which is obtained from petroleum, shale oil and lignite. The principal source is petroleum, and the East Indian petroleums produce the highest melting point.

**Characteristics:** The crude wax is white or yellow in color and runs in melting point from about 104° to 128° F. It contains a certain percentage of oil and moisture. It is sometimes known as "scale wax" and is generally shipped in wooden barrels. The refined wax is water white in color, the oil and moisture being eliminated in the refining process; generally molded in cakes and shipped in bags or cases. The melting point runs from 118° to 140° F.

## VARIOUS MIXTURES

There are three kinds of wax compounds in use, those that are mechanical mixtures, chemical mixtures and a chemical and mechanical mixture combined.

In the electrotyping plants use is made of a mechanical mixture. This usually consists of a wax with some hardening or softening compound (as the case may require) and graphite, which is intended primarily for its conducting (electrical) purposes. Some workers prefer to omit this and apply it after the impression to be duplicated is made.

The chemical mixtures are chiefly used in phonographic recording laboratories. These compounds must possess certain physical characteristics, such as freedom from brittleness and greasiness, and must not be affected by the electrotyping solution.

The methods of procedure for making either of the waxes are quite simple and need very little apparatus, the chief requisites being a source of heat, direct flame or steam (superheated) to melt the compounds. An iron vessel (preferably enamelled) and a suitable stirring rod such as a ladle will suffice.

**Hackewitz:** Stearic acid 20 lbs.; thick oil of turpentine 20 lbs; rosin 10 lbs; graphite 50 lbs.

**Schor:** Beeswax 2 lbs.; paraffin 6½ lbs.; rosin 1½ lbs; graphite 1 lb.

**Dodge:** Pitch 101 lbs.; paraffin 30 lbs.; carnauba 5 lbs; rosin 10 lbs.

**Furlong:** Beeswax (refined) 850 lbs.; crude turpentine 100 lbs.; graphite 50 lbs. In hot season 50 lbs. Burgandy pitch is added to the mass.

**Urquhart:** Yellow beeswax 900 lbs.; Venetian turpentine 135 lbs.; graphite 22.

**Cowper-Coles:** Beeswax 9 lbs.; graphite 5 ozs.; Venetian turpentine 1 lb.

**Kempe:** Yellow beeswax 700 lbs.; paraffin 100 lbs.; Venetian turpentine 55 lbs.; graphite 175 lbs.

**Proctor:** Modelling wax. Yellow beeswax 1,000 lbs; Venetian turpentine 130 lbs.; Lard 63 lbs.; Armenian bole 725 lbs. Melt together the ingredients and while still in the liquid state pour into tepid water; knead this like dough, until a plastic mass is obtained.

**Proctor:** Summer modelling wax. Stearic acid 20 lbs.; turpentine 4 lbs.; oil of sesame 1 lb.; vermilion 2 lbs. Treat this compound like the preceding one.

**Proctor:** Winter wax. Stearic acid 20 lbs.; turpentine 6 lbs.; oil of sesame 2 lbs.; vermillion 2 lb.

**Von Kress:** White wax 120 lbs.; stearic acid 50 lbs.; tallow 30 lbs.; Syrian asphalt 40 lbs.; graphite 5 lbs.

**Pfanhauser:** Yellow beeswax 400 lbs.; ozokerite 300 lbs.; paraffin 100 lbs.; Venetian turpentine 60 graphite 100 lbs. The composition is modified for the summer months and the proportions used are: Yellow beeswax 250 lbs.; ozokerite 450 lbs.; paraffin 50 lbs.; Venetian turpentine 35 lbs.; graphite 180 lbs.

Almost any fine or close grained material will answer the purpose of a strainer. Some workers prefer to use very fine bronze gauze, whereas other use double or single layers of gauze, silk, cotton duck, cambric, etc. Every one seems to have his pet way of doing this operation. The chief point, however, is to remember that the material must have little or no lint, as this will be taken along with the wax compound as it is being strained.

Dust and sudden draughts of air are dangerous during the process of molding the compounds. The proper procedure is to strain the molten material into a pan of the desired size. This pan must be previously heated in order that the mass, on being poured into the pan, is not chilled. After the pan is filled with the material it is covered with a piece of cardboard which has a hole in it in order to permit the escape of the hot air of the molten mass. The pan must be kept in a warm room as cold rooms have a tendency to chill the wax, and crystalline striæ will be found on its surface.

OLDER MIXTURE

Tainter (U. S. patent No. 393190 Nov. 20, 1889) finds that carnauba when mixed with beeswax improves the former to the extent of reducing its brittleness. Satisfactory results have been obtained with:

| | |
|---|---|
| Carnauba | 60 lbs. |
| Beeswax (bleached) | 40 lbs. |

This wax can be used over and over again and it is said by the inventor to be better than other wax compounds.

A composition recommended by Suggett and which is extensively used in Europe, consists of:

| | |
|---|---|
| Ozokerite | 4 lbs. |
| Carnauba | 1 lb. |

A great deal of care must be exercized with this compound, as a sudden change in temperature on cooling from its molten state is apt to crack it.

Edison (U. S. patent No. 400648 April 2, 1889) finds that ordinary waxes such as ceresine, paraffin or beeswax is too soft for practical phonographic purposes. Ceresine is therefore hardened with stearic acid. A typical mixture is:

| | |
|---|---|
| Ceresine | 100 lbs. |
| Beeswax | 25 lbs. |
| Stearic acid | 25 lbs. |

The compounds are mixed in the usual manner.

Edison (U. S. patent 430274 June 17, 1890) mixes equal amounts of lead oleate and lead stearate.

Macdonald (U. S. patent 606725 July 5, 1898) has encountered several of the chief difficulties in making waxes for phonographic purposes. Previous to this patent the soaps had a tendency to assume a bluish film, having the appearance of mold, and which really is due to the hygroscopic compounds in the mass. This latter characteristic is termed "efflorescence," causing the metallic compound to work its way out onto the surface and in the form of very fine crystals. These drawbacks are taken care of in the following formulas and methods of preparing them:

| | |
|---|---|
| Stearic acid | 408 lbs. |
| Aluminum hydroxide | 7 lbs. |
| Sodium hydroxide | 85 lbs. |

To this is added, for the purpose of tempering, paraffin, ozokerite, or other similar waxes 72 lbs.

The method of procedure which has been worked out experimentally is as follows. The sodium hydroxide is mixed with water until 37.50° Bé is obtained, and this is heated to its boiling point about 240° F. The aluminum hydroxide is added and is rapidly assimilated in the alkali. The stearic acid is melted and raised to a similar temperature when the alkali is added thereto, in small quantities at a time and slowly. It will readily unite, but if too great a quantity be added at a time, or the temperature is excessive, violent ebullition will take place and cause the material to overrun the vessel in which it is heated, the danger of fire always requiring the observance of caution. When the saponification is completed, the remaining water in the mixture must be slowly evaporated, and this is best done by raising the temperature considerably, which, however, must never exceed 350° F. in order that the composition shall not be charred. When the water is quite expelled, which will be obvious by the absence of steam bubbles and the reduction of the mass to an oleaginous condition, the tempering elements may be added. Another formula given consists of:

| | |
|---|---|
| Stearic acid | 300 lbs. |
| Aluminum (powdered) | 1½ lbs. |
| Sodium hydroxide (37.5 Be) | 9 lbs. |
| Sal soda dissolved in 12 gals. water | 60 lbs. |
| Ceresine | 60 lbs. |

In this formula the sal soda and sodium hydroxide can be united before the aluminum is added, or the latter can be added to the sodium hyroxide, and the two liquids then united. Instead of powdered aluminum, ordinary ingot may be used with results almost identical.

### LEAD MIXTURES

The objection urged by some investigators against the use of lead waxes for recording purposes is not well founded. The fact that the earlier lead waxes were improperly made, and that they were commonly associated with surface "bloom" or "efflorescence," or with crystallizable compounds in their substance, had nothing to do with the employment of lead salts. The first named defect was due entirely to the presence of water in the compound which had not been sufficiently evaporated in the process, and which very naturally sweated out upon the surface. To have remedied this it would have been only necessary to allow the mass to simmer for a more extended time. The second named defect was due to an excessive temperature in the saponification, by which the water of the alkali was separated from the soda and driven off before it had completed its work of attacking the stearic acid. The "crystallizable compounds" consisted of nothing more than conglomerations of free soda, and the addition of water to the mixture with a further simmering would be sufficient to get rid of the trouble.

Aylsworth (U. S. patent 676111 June 11, 1901) makes use of an alkaline lead wax of the higher fatty acids and of the acetic series, such as sodium stearate, palmitate or oleate together with resinous substances such as colophony, gum copal or gum kauri and a hydrocarbon (paraffin, ozokerite or ceresine). The following formula produces, it is claimed, a mass which is non-crystallizable, hard, and more or less transparent (translucent):

| | |
|---|---|
| Stearate and palmitate of soda, containing 6.9 lbs. sodium oxide ($Na_2O$) | 96 lbs. |
| Stearate and palmitate of lead, containing 21 lbs. of lead oxide (PbO) | 73 lbs. |
| Lead oleate, containing 2.5 lbs. lead oxide | 9 lbs. |
| Colophony | 10 lbs. |
| Ceresine | 2 bs. |

Should a harder composition be required the ceresine in this case is omitted, or the lead oleate is reduced in proportion.

One of the most satisfactory compositions used by Clements-Henry, which has the merit of being cheap and comparatively easy to prepare, and which he has worked out in a number of classified experiments and put to the various tests, is embodied in the following formula:

| | |
|---|---|
| Stearic acid | 56 lbs. |
| Sodium hydroxide | 3½ lbs. |
| Dissolved in water about | 15 lbs. |
| Red lead | 3 lbs. |
| Paraffin | 16 lbs. |
| Japan wax | 2 lbs. |

The stearic acid is melted in an iron vessel (enamelled). The sodium hydroxide is dissolved in the water, after which the saponification is proceeded with. The precaution as to adding the alkali slowly must be remembered, and when every trace of water has been slowly evaporated on the completion of the saponification, the lead, which is in the form of a powder, may be thoroughly mixed with a small quantity of the molten wax in order to facilitate its absorption by the mass. It can then be very slowly added to the mass by means of a small ladle, when its chemical absorption will be gradually apparent by the mass changing color from a bright red to that of a light limpid gamboge. As this takes place, a further addition of the red lead mixture can be made to the mass, until the whole is properly incorporated. As soon as this process is completed, the addition of the paraffin and Japan wax may be made, and when thoroughly amalgamated the composition is ready.

The foregoing formula is specially applicable for cylindrical recording and not for disc records.

Aylsworth (U. S. patent 920245 May 4, 1909) adds 400 lbs. stearic acid to 200 lbs. melted resin gum (copal, kauri or colophony), the temperature is raised to 250° and gradually raised to 400° F. When the stearic acid and the gum are thoroughly melted 100 lbs. of litharge or lead oxide is added, which results in the formation of lead stearate with possible traces of free stearic acid and possibly some resin acid salts of lead. The reaction results in the generation of water, which is driven off as steam. To this compound is added from 100 to 400 lbs. asphalt, the amount depending on the ultimate characteristics to be possessed by the mixture. This done, the temperature is raised to 400° F. and maintained until the mass ceases to react and is limpid.

A somewhat modified formula made by the author consists of

| | |
|---|---|
| Stearic acid | 59.5% |
| Sodium hydroxide | 8.5% |
| Red lead | 6.4% |
| Paraffin (refined) | 25.6% |

Its melting point is 325° F. The viscosity at 400° F. is 2.7586 (the viscosity of refined paraffin being taken as standard at the same temperature).

The penetrations taken with a standard asphalt penetrometer were as follows:

| | |
|---|---|
| 70° F. | 0.0 |
| 100° F. | 0.0 |
| 120° F. | 0.0 |
| 140° F. | 0.5 |
| 160° F. | 1.0 |

The specific gravity at 60° F. is 1.0141.

### MISCELLANEOUS MIXTURES

Cheney (U. S. patent 854801 May 28, 1907) alloys equal parts of ceresine and paraffin with good results.

The two waxes are brought gradually to the boiling point of the mixture (350-400° F.) and this is maintained for an hour or more.

Aylsworth (U. S. patent 855552 June 4, 1907) recommends:

| | |
|---|---|
| Asphalt | 80 lbs. |
| Stearin pitch | 20 lbs. |

Stearin pitch, as is well known, is a black tarry resinous compound obtained in the manufacture of stearic acid and resembles ceresine.

The writer has had an occasion to use this compound and found it to be somewhat too hard for phonographic recording purposes. Probably a different proportion would answer the purpose as for instance a greater amount of the stearin pitch.

The following formula is recommended by Seymour. It is said by him to be cheap and comparatively easy to prepare, it consists of:

| | |
|---|---|
| Stearic acid | 28 lbs. |
| Sodium hydroxide | 2 lbs. |
| Aluminum oxide | 1 lb. |
| Ceresine (bleached) | 6 lbs. |
| Water | 12 lbs. |

The stearic acid is melted and the sodium hydroxide and aluminate of soda are boiled in the water. The mass is heated until the saponification is complete. The ceresine is melted separately and poured into the mixture afterwards.

A simple composition recommended by Clements-Henry consists of:

| | |
|---|---|
| Stearic acid | 12 lbs. |
| Sodium hydroxide | 1 lb. |
| Aluminum oxide | 1 lb. |
| Ceresine or paraffin | 2 lbs. |

The sodium hydroxide is dissolved in about twice its weight of water and boiled and to this is added the aluminum oxide. This compound is slowly poured into the molten stearic acid and stirred. The mass is kept cooking until all the water is driven off (the mass being stirred all the time.) The cooking process is continued for another hour or so, the temperature being about 450° F. (not more, for fear of flashing).

The latest composition to be introduced to the trade by German chemists consists of ozokerite and paraffin in about the proportions of two to one respectively. This is a very homogenous mass, both belonging to the same series of mineral waxes, the former presenting a brilliant surface in cutting, while the latter is used only as a tempering medium. It is an ideal compound, the only objectional feature being that of its brittleness.

# Bronze Backed Connecting Rod Bearings

**Written for The Metal Industry by P. W. BLAIR, Mechanical Editor**

Q.—We would like to know the most commonly practiced methods of turning out bronze-backed connecting-rod bearings. We mean the machined ones such as are turned out by several Detroit manufacturers. These bearings are in halves, are bronze back with babbitt face or lining. If you have ever published an article on the subject, we would appreciate a copy. Or if you could give us some light on the following questions:

Is the bronze stock used in this work merely bronze tubing? Are these shells made in a screw machine? Turret lathe? What machine is more commonly employed? What lengths do these tubes come in? Is the tinning and babbitting of the tubes done before or after the bronze is turned? We desire to machine turn the whole bearing, both in bronze and babbitt sides. From whom may this stick be bought? What are the most approved acids or fluxes used in tinning the brass backs?

Now many of these bearings have crossed and spiral oil ways. With what sort of a machine tool are these

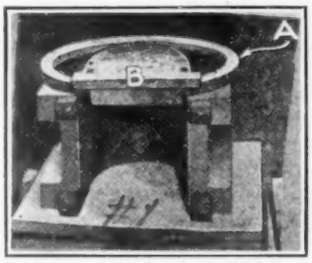



FIG. 1. DRIVING BOX BUSHING READY FOR BABBITT

FIG. 2. HUB LINING AFTER POURING

oil ways cut in the babbitt? From whom may they be purchased?

A.—The bronze stock used on bushings or connecting-rod bearings or bushings are bronze castings, all bronze and babbitt lined. The tinning and babbitting is done after the inside is machined. They are tinned with an alloy of 50 per cent. tin and 50 per cent. lead, and babbitted, using muriatic acid as a flux.

Fig. 1 shows a driving box bushing ready to receive the babbitt lining and is prepared for holding the babbitt in the usual way. The partial ring A forms the outside of the mold, the casting B holding the ring in position during the pouring operation.

Fig. 2 shows the hub lining just after it has been poured, showing the ring completely filled with the metal. Several concerns manufacture oil grooving machines for bearings. By different combinations of movements of

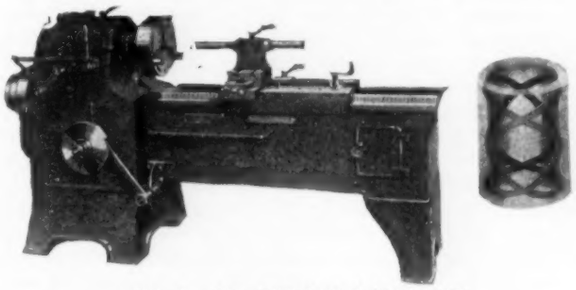


FIG. 3. OIL GROOVING MACHINE

the tool and work, oil grooves of various types can be produced. By holding the work stationary and reciprocating the tool slide, a straight oil groove may be cut parallel with the axis of the bearing, but with the tool slide stationary and the work revolving, a circular groove may be cut in a plane, perpendicular to the axis. By operating both movements simultaneously grooves may be cut at any angle to the axis of the bearing.

In order to cut grooves that are symmetrical, it is necessary to have some means of compensating for the errors which would result from the angularity of the connecting-rod, which transmits the reciprocating motion to the carriage.

See Fig. 3 illustrating an oil grooving machine and sample of work performed on it.

Small bronze bushings used on automobiles and small electrical work are made from solid and cored castings and machined on screw machines outside and inside and to hold to close limits for inside boring are broached to size for internal dimensions.

# The Application of Gas to Japanning

## A General Description of the Methods and Apparatus, Using Gas As a Fuel*

By W. J. HAMPTON, Detroit City Gas Company, Detroit, Mich.

In inviting me to present a paper on the subject of japanning, your committee have been influenced, I believe, by the fact that Detroit has a great variety of japanning installations. By that I mean that the installations themselves are varied rather than the nature of the work. The process of japanning a few years ago in Detroit was new enough to occasion much interest. It was a fact that it was a source of business greatly desired by central stations and did apparently present some features which would make electric currents seem like a logical source of heat for this work. Superiority of oven design and construction, cleaner work and adaptability were the points upon which the electric companies laid stress. Several installations were made by them and given all the publicity possible until greater activity on the part of the gas company brought about better design of gas-fired ovens. Many of the statements in favor of the electric oven were proven unfounded and misleading. The gas man learned more of the problems of japanning and thus equipped, was better fitted to go after this business to get it, hold it and in so doing really proved that in quality of work turned out the gas-fired oven was every bit as good as the electric oven at its best, with the points of fuel cost, equipment costs, and maintenance cost greatly in its favor. With these facts proven to the manufacturers throughout the city it was only logical that gas-fired japanning ovens began to come into more general use, until today the installation of a gas-fired japanning oven is accepted as a natural consequence.

So much has been said and written in the circles of gas men concerning gas for japanning, that to make this paper a treatise on the subject would be a waste of time. There is nothing mysterious about the operation itself. The average industrial engineer today does not consider it a feat of any great moment to step into a factory and lay out a complete japanning equipment from beginning to end. He may recommend either of the general methods of cleaning the parts to be japanned or the manner of applying the coating and is guided in each case by the shape, size and purpose of the parts to be treated, bearing in mind that the great thought in the mind of the factory manager, owner or executive today is the desire for greater production. He will welcome decreased unit costs and increased production in any department. If he has in use a japanning department there is an opportunity for you to analyze the methods used, and very often find it possible to make suggestions which will tend to speed up some phases of the several operations.

Scarcely more than a dozen years ago japanning was considered a peculiarly obscure and difficult art. In the city of Detroit at that time, comparatively little japanning was being done; men who understood the work were hard to find, and many manufacturers of articles using japanned parts preferred to have the work done outside of their plant rather than go to the expense of installing their own japanning equipment and run the risk of getting a large percentage of imperfect work through the mistake of inexperienced workmen.

The quantity-production of the automobile in the last few years has perhaps done more toward the development of japanning than has any other industry. At the present time nearly every manufacturer in Detroit who makes use of japanned parts has, in his own plant, japanning oven equipment and workmen sufficiently skilled to turn out work of excellent quality with a very small percentage of rejection.

The number of automotive vehicles manufactured in this city has been so great, however, that many plants have not been able to keep their japanning departments in pace with their stamping and machining operations. This condition has led to the establishment of many small jobbing shops, which seem to have sprung up like mushrooms in the night in many parts of the city. These shops solicit the work from the manufacturer whose ovens are taxed to capacity, and do the work for them under their indirect supervision and careful inspection.

Japanning consists roughly of three operations:

### CLEANING THE MATERIAL.

There are two methods of cleaning in general use in this city. The first and commonest way is by dipping the work in a hot soda solution, rinsing it in boiling water and allowing it to dry in the atmosphere. The other method is by passing the work through a flame or a hot chamber and burning off the dirt and oil which has accumulated on it in the previous operations of its manufacture. The former method is employed with work of large size and with work requiring a high finish; the latter when parts are small or when the shape of the piece would make the drying difficult.

When the piece has been thoroughly cleaned and dried, the japan is applied. This, in general practice is done by dipping or by spraying. The shape of some pieces necessitates the use of a tumbling barrel while some have to be done with a brush by hand. The opinions of manufacturers differ as to whether the dipping tank or the spray is the most practical and efficient method of application. When dipped the work must be hung over dripping boards and allowed to drain. Lack of floor space sometimes demands a method wherein the draining room is eliminated. Jobbing shops as a rule dip their work.

### SPRAYING THE JAPAN.

In spraying, the enamel is applied to the work through a nozzle in which the liquid is dissipated by pressure to a fine mist. The operator uses the spray in somewhat the same manner that he would use a brush. Excess vapors are carried off through the exhausters in the side of the spray brush opposite the operator. When the spray is used the enamel is applied in such a thin coat that it can usually be placed in the oven immediately afterward. Many manufacturers in this city are using spray equipment.

### DRYING OR BAKING THE JAPAN COAT

After the application of the japan the coat may be either air dried or baked. When air dried it must be suspended in a dust-proof chamber for from one to eight days, the time of drying depending upon the type of japan enamel used. If the piece requires a gloss coat this operation must be repeated. It can readily be seen that japanning shops using this antiquated method could not long compete with shops turning out oven work of a superior quality in from forty-five minutes to one hour's time.

The construction of the baking ovens varies from the simple, box shaped sheet iron shell, to the highly devel-

*A paper read at the recent convention of the American Gas Association in New York.

oped, well insulated and correctly vented oven. It may be equipped with racks or shelves; the work may be introduced and withdrawn from the baking compartment by trucks upon which it is hung; or the installation may be of the latest type of conveyor oven.

The ovens in the smaller shops are interesting as a whole chiefly because of their variety in construction. Their one and common point, it seems, is the fact that nearly all of them are gas-fired. The work japanned in the jobbing shops consists mainly of automobile fenders and hoods but many small parts, top braces, windshield holders and miscellaneous pieces are japanned by them for the automobile trade.

The heating equipment in nearly all of these ovens consists of pipe burners and atmospheric mixers. It has been our experience that a properly designed pipe burner will give the most satisfactory results. Its cost is low and its upkeep is negligible. When the ovens to be heated are large it is advisable to use gas at boosted pressures. Gas at from one-half to one pound pressure will allow of a more flexible heat control with increased operating speed. With "increased production" the goal of the factory managers, it is important that working heats be reached quickly. The ovens may have to be rushed and with boosted pressures it is possible to do so. The indirect type of oven with high pressure gas can be forced safely, but the ordinary direct fired oven requires more careful attention in the time the temperature is being brought up to working heat. This type of oven is the highest development in the stationary type, but for modern methods of production the conveyor oven is filling a need in a most satisfactory manner. In this oven the various operations are co-ordinated and waste motion reduced to a minimum.

When an oven is operating normally, bakes are made in from forty to fifty-five minutes, the time depending upon the character of the work and the composition of the japan. Baking heats vary from 410 degrees to 550 degrees Fahr. in ovens of the common design.

We have in this city many conveyor ovens of various sizes, doing many different kinds of work. It is interesting to note that electric oven makers contended for a long time that conveyor ovens could not be successfully operated with gas. The ovens of this kind now in constant use entirely discredit this assertion.

The Detroit Vapor Stove Company of this city have recently built and are now using a conveyor oven unique in many particulars. This firm manufactures oil stoves; their production averages 500 stoves per day. Their japanning oven consists of three conveyor ovens, one of which is 75 feet in length, one 70 feet long and the newest one 100 feet long. The 75-foot oven is equipped with a conveyor belt which carries the work from the unassembled pieces, through the complete assembly process, spray booth, japanning oven, inspection and deposits the completed stove on the shipping room platform. The 70-foot oven is very similar in construction. These two ovens were used in lifeboat construction during the war, the entire assembled boat passing through the oven.

The new oven is so different from the ordinary conveyor type that I believe its description is warranted here.

This oven is only 33 inches wide inside by 67 inches high. The first 40-foot section of this oven is separated from the last 60 feet by a space of about 20 feet in which two spray booths are built, faced in opposite directions. These booths are equipped with De Vilbis Aeron Sprays, the fumes from each of which are exhausted by four fans which vent through vertical flues to the roof.

The system is equipped with a Link Belt which travels at the rate of 100 feet in 35 minutes. Upon this belt the stove is assembled. It passes then through the first 40 feet of the oven, in which a temperature of 550 degrees Fahr. is maintained. In this section the oil and dirt is burned off. It passes through this section in about 14 minutes. Passing then through the spray booths the first operator sprays the enamel on one side of the stove; the second operator finishes it by spraying the other side. The stove goes from the sprays directly into and through the oven in about twenty minutes. A heat of 475 degrees Fahr. is maintained over almost the entire length of this oven.

When the work emerges the stove burners are installed, the fuel tank is filled and attached, the burners are lighted, tested and adjusted before the stove is taken from the carrier.

The 10-foot burners of the type mentioned before furnished the heat for both the heating and baking sections of the oven. They are placed end to end in a single row which runs through the centre of the oven. The gas passes through a 17-inch mixing tube and an elbow, into the burners themselves. The mixers are placed at the side of the oven in groups of two, are fed through a common feed pipe in which the gas flow is controlled by a Robert Shaw thermostat.

Gas is furnished to these burners and to the other ovens by means of one No. 50 and one No. 35 Connersville booster tied into a common feed line.

The oven is insulated on top, sides and bottom with panels of Johns-Manville Sponge Felt 3 inches in thickness. This is said to be entirely satisfactory and is giving as good results as the 4-inch slabs of magnesia insulation on the other ovens.

In conclusion, I would like to emphasize this point. Japanning can be rushed only up to the point just short of turning out tacky work and in the finest sort of high grade work quality, of course, is the first consideration. For this work the conveyor oven has no particular advantage. For the general run of work, however, the conveyor oven has many advantages over the stationary type, all tending toward the point of maximum production.

## Plating Room Floors

A large New England concern, manufacturing brass goods has reconstructed its plating room and the construction of the floors was given special consideration, when the new arrangements were planned. The floor which was chosen, and which has given satisfactory service since the 1st of January, is made of bricks set on edge in a cement mortar. The bricks project one inch above the cement mortar. In the channels between the bricks water runs to the drains toward which the floor is graded.

The workmen walk around on a dry floor, since the liquid drippings, which run off from the parts, as they are taken out of the baths are not of sufficient volume to overflow the channels. Each afternoon, after working hours, the entire floor is washed down with a hose, so that there will be no opportunity for the collection of concentrated solution and acid drippings.

Such a floor saves money in everyday operation in the time saved in keeping it clean and the comfort it affords the employees. It also eliminates the danger of accidents from slipping on elevated slat platforms made of wood, which become slimy and slippery, and which also have to be raised up and moved around when flushing a solid concrete floor.

P. W. Blair.

# Chemical, Commercial and Common Names of Chemicals Used in Dipping, Plating and Coloring of Metals

Written for The Metal Industry by Charles H. Proctor, Plating-Chemical Editor.

A good deal of confusion often exists because of the indiscriminate use of the chemical, commercial and common names of substances in formulæ for dipping, plating, coloring, and lacquering of metals. Often in my own experience, when experimenting with various formulæ, both native and foreign, the terms given have been somewhat confusing and required a search.

### ACIDS AND ACID COMPOUNDS

**Acetic Acid.** $HC_2H_3O_2$; hydrogen acetate, acid of vinegar.

**Acid Phosphate.** $CaH_4(PO_4)_2.2H_2O$; soluble acid phosphate; super-phosphate of lime.

**Amyl Acetate.** $CH_3CO_2C_5H_{11}$; banana oil.

**Amyl Nitrite.** $NO_2C_5H_{11}$; isoamyl nitrite.

**Amyl Valerianate.** $C_6H_9CO_2C_5H_{11}$; apple oil; amyl valeriate.

**Benzoic Acid.** $C_6H_5CO_2H$; acid plenylformic.

**Boracic Acid.** $H_3BO_3$; boric acid; hydrogen borate.

**Carbolic Acid.** $C_6H_5OH$; phenol; phenic acid; phenylic acid.

**Carbonic Acid.** $H_2CO_3$; hydrogen carbonate.

**Chromic Acid.** $CrO_3$; anhydrous chromic acid; chromium trioxide.

**Citric acid.** $(CO_2HCH_2)_2C(OH)CO_2H$; acid of lemons.

**Formic Acid.** HCOOH.

**Hydrocyanic Acid.** HCN; prussic acid.

**Hydrofluoric Acid.** HF; fluoride of hydrogen.

**Gallic Acid.** $C_6H_2(OH)_3CO_2H.H_2O$; tryoxybenzoic acid.

**Lactic Acid.** $CH_3CHOHCOOH$; acid of milk.

**Malic Acid.** $COOHCH_2CH(OH)COOH$; apple acid, oxysuccinic acid.

**Nitric Acid.** $HNO_3$; aqua fortis.

**Nitro-Hydrochloric Acid.** Aqua Regia; nitro-muriatic acid. (Solvent for gold and platinum.)

**Oxalic Acid.** $H_2C_2O_4$; hydrogen oxalate.

**Phosphoric Acid.** $H_3PO_4$; ortho-phosphoric acid.

**Glacial Phosphoric Acid.** $HPO_3$.

**Plumbic Acid, Anhydrous.** $PbO_2$; lead dioxide; lead peroxide; lead superoxide.

**Pyrogallic Acid.** $C_6H_3(OH)_3$; pyrogallol.

**Salicylic Acid.** $C_6H_4(OH)(COOH)$; ortho-hydroxybenzoic acid.

**Selenous Acid.** $H_2SeO_3$; selenious acid.

**Stearic Acid.** $(CH_3CH_2)_{16}CO_2H$; stearinic acid; acid cetylacetic.

**Sulphuric Acid.** $H_2SO_4$; oil of vitriol; vitriolic acid.

**Sulphuric Acid.** $H_2SO_3$.

**Tartaric Acid.** $H_2C_4H_4O_6$; acid of tartar; dextrotartaric acid.

### ALCOHOLS

**Alcohol.** $C_2H_5OH$; ethyl alcohol; ethyl hydrate; spirits of wine.

**Amyl Alcohol.** $CH_3CH_2CH(CH_2)OH$; fusel oil, potato oil; potato spirit; grain oil.

**Methyl Alcohol.** $CH_3OH$; wood alcohol; wood naphtha; wood spirit.

### ALCOHOL SOLVENTS

**Benzine.** Petroleum ether.

**Benzene.** $C_6H_6$; benzol.

**Solvent Naphtha.** 160° benzol.

**Sulphuric Ether.** $(C_2H_5)_2O$; ether.

**Bisulphide of Carbon.** $CS_2$.

### ALUMS

**Alum.** $Al_2(SO_4)_3.K_2SO_4.24H_2O$; sulphate of aluminum and potassium.

**Ammonia Alum.** $Al_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$; sulphate of aluminum and ammonium.

**Burnt Alum.** Dried alum; aluminum-potassium sulphate calcined.

**Chrome Alum.** $K_2(SO_4).CrSO_4.24H_2O$; double sulphate of chromium and potassium.

**Roach Alum.** Roman alum; red alum.

**Soda Alum.** $Al_2Na_2(SO_4)_4.24H_2O$; sulphate of aluminum and sodium.

### ALUMINUM COMPOUNDS

**Aluminum Chloride.** (a) $Al_2Cl_6.12H_2O$; (b) $Al_2Cl_6$.

**Aluminum Hydrate.** $Al(OH)_3$; aluminum hydroxide; hydrated alumina.

**Aluminum Nitrate.** $Al(NO_3)_3$; nitrate of alumina.

**Aluminum Oxide.** $Al_2O_3$; alumina (emery and corundum are varieties of the oxide).

**Aluminum Sodium Fluoride.** $3NaF.AlF_3$; cryolite.

**Aluminum Sulphate.** $Al_2(SO_4)_3$.

### AMMONIUM COMPOUNDS

**Ammonia, Solution of.** $NH_4OH$; ammonia; ammonia water; ammonium hydrate; spirits of hartshorn.

**Ammonium Acetate.** $NH_4(C_2H_3O_2)$.

**Ammonium Arseniate.** $(NH_4)_3AsO_4$.

**Ammonium Benzoate.** $(NH_4)C_7H_5O_2$.

**Ammonium Bromide.** $(NH_4)Br$.

**Ammonium Carbonate.** $(NH_4)_2CO_3$; neutral carbonate of ammonia; volatile salt.

**Ammonium Bicarbonate.** $NH_4HCO_3$; acid carbonate of ammonia; ammonium-hydrogen carbonate.

**Ammonium Chloride.** $NH_4Cl$; sal ammoniac, muriate of ammonia.

**Ammonium Citrate.** $(NH_4)_3C_6H_5O_7$.

**Ammonium Nitrate.** $NH_4NO_3$.

**Ammonium Oxalate.** $(NH_4)_2C_2O_4.H_2O$.

**Ammonium Phosphate.** $(NH_4)_3PO_4$; ammonium di-phosphate.

**Ammonium Sulphate.** $(NH_4)_2SO_4$.

**Ammonium Sulphide.** $(NH_4)_2S$; sulphuret of ammonia.

**Ammonium Sulphydrate.** $(NH_4)HS$; hydrosulphide of ammonia; ammonium and hydrogen sulphide.

**Ammonium Sulphocyanide.** $NH_4SCN$; ammonium sulphocyanate.

**Ammonium Tartrate.** $(NH_4)_2C_4H_4O_6$.

**Ammonium Valerianate.** $NH_4C_5H_9O_4$.

### ANTIMONY AND ITS COMPOUNDS

**Antimony, Metallic.** Sb; regulus of antimony.

**Antimony, Butter of.** $SbCl_3$; antimony trichloride; chloride of antimony.

**Antimony Glass.** $Sb_2O_3$; $Sb_2O_4$; $Sb_2O_5$; vitrified antimony; gray oxide of antimony; vitrified oxide of antimony.

**Antimony Pentasulphide.** $Sb_2S_5$; antimony sulphide.

**Antimony, Red.** $Sb_2S_3$; crocus of antimony.

**Antimony Tartrated.** $K(SbO)C_4H_4O_6$; tartar emetic; antimony-potassium tartrate.

### ARSENIC AND ITS COMPOUNDS

**Arsenous Acid.** $As_2O_3$; white arsenic, arsenous anhydride.

**Arsenic Disulphide.** $As_2S_2$; realgar; red orpiment; ruby arsenic; red arsenic glass.

**Arsenic Fluoride.** $AsF_3$; arsenic trifluoride.

**Arsenic Pentasulphide.** $As_2S_5$; persulphuret of arsenic.

**Arsenic Trichloride.** $AsCl_3$ chloride of arsenic.

**Arsenic Trisulphide.** $As_2S_3$; yellow orpiment; yellow sulphide of arsenic; king's yellow.

BARIUM COMPOUNDS

Very few of these compounds are used in electroplating. They consist of the acetate, arsenate, bromide, carbonate, chloride, chlorate, ferro-cyanide, hydrate, iodide, nitrate, oxalate, monoxide, phosphate and sulphate.

**Barium Sulphide.** BaS, is the only compound in general use. Sulphide of barium, barium mono-sulphide, baric sulphide.

CALCIUM COMPOUNDS

**Calcium Carbonate.** $CaCO_3$; chalk; limestone; marble; calcite; calc spar.

**Calcium Chloride.** $CaCl_2$; muriate of lime.

**Calcium Hypoclorite.** $Ca(ClO)_2.4H_2O$; bleaching powder.

**Calcium Hydrate.** $Ca(OH)_2$; slaked lime.

**Calcium Oxide.** CaO; quicklime.

**Calcium Sulphate.** $CaSO_4$; plaster of paris; gypsum.

There are many other calcium compounds, but they have no connection with plating.

COBALT COMPOUNDS

**Cobalt Chloride.** $CoCl_3$ (cobaltic); $CoCl_2$ (cobaltous).

**Cobalt Cyanide.** $Co(CN)_2$.

**Cobalt Nitrate.** $Co(NO_3)_2$.

**Cobalt Sulphate.** $CoSO_4$.

**Cobalt Ammonium Sulphate.** $CoSO_4(NH_4)_2SO_4+6H_2O$.

COPPER COMPOUNDS

**Copper Acetate.** $Cu(C_2H_3O_2)_2.2H_2O$; crystallized verdigris; neutral or normal acetate of copper.

**Copper Arsenite.** $CuHAsO_3$; Scheele's Green.

**Copper Carbonate.** $Cu_2(OH)_2CO_3$; dicupric carbonate of copper; green copper carbonate; Brunswick green.

**Copper Chloride.** $CuCl_2$; cupric chloride; neutral chloride of copper.

**Copper Cyanide.** $Cu(CN)_2$.

**Copper Nitrate.** $Cu(NO_3)_2.3H_2O$; cupric nitrate.

**Copper Oxide.** $Cu_2O$; red oxide of copper; suboxide.

**Copper Sulphate.** $CuSO_4.5H_2O$; blue vitriol; blue stone; blue copperas; Roman vitriol.

**Cupric Oxide.** CuO; oxide of copper, black oxide of copper.

GOLD COMPOUNDS

**Gold Chloride.** AuCl; aurous chloride; gold monochloride.

**Gold Cyanide.** $KAu(CN)_2$; gold-potassium cyanide; potassium cyanaurate.

**Gold Fulminate.** $Au(HN)NH_2.3H_2O$; auroamidoimide; a precipitate from chloride by ammonia.

**Gold Monoxide.** $Au_2O$; aurous oxide.

IRON COMPOUNDS

There are a great variety of iron compounds; many of them of no interest to the electroplater.

**Citrate of Iron and Ammonia.** Ammonio-ferric citrate.

**Chloride of Iron.** $FeCl_3$; Ferric chloride; perchloride of iron; permuriate of iron; sesquichloride of iron.

**Ferric Ferrocyanide.** $Fe_4[Fe(CN)_6]_3$; prussian blue; ferrocyanide of iron.

**Ferric Hydrate.** $Fe(OH)_3$ hydrated oxide of iron; moist peroxide of iron.

**Ferroso-Ferric Oxide.** $FeO.Fe_2O_3$; magnetic oxide of iron.

**Ferrous Ammonium Sulphate.** $Fe(SO_4).(NH_4)_2SO_4.6H_2O$;; Mohr's Salt.

**Oxide of Iron.** $Fe_2O_3$; Ferric oxide; iron peroxide; red oxide of iron; rouge; Indian red.

**Sulphate of Iron.** $FeSO_4.7H_2O$; green copperas; green vitriol.

LEAD COMPOUNDS

**Lead Acetate.** $Pb(C_2H_3O_2)_2.2PbO.H_2O$: sugar of lead; plumbic acetate.

**Lead Carbonate.** $2PbCO_3.Pb(OH)_2$; white lead.

**Lead Oxide.** PbO; litharge, yellow oxide of lead; lead monoxide.

**Lead Cyanide.** $Pb(CN)_2$.

**Lead Silicate.** $PbSiO_3$.

**Lead Fluoride.** $PbF_2$.

**Lead Fluoborate.** $Pb(BF_4)_2$.

**Lead Sulphate.** $PbSO_4$.

MAGNESIUM COMPOUNDS

**Magnesium Carbonate.** $MgCO_3$.

**Magnesium Chloride.** $MgCl_2.6H_2O$.

**Magnesium Oxide.** MgO; Calcined magnesia.

**Magnesium Sulphate.** $MgSO_4$; Epsom salt; cathartic salt.

MANGANESE COMPOUNDS

**Manganese Acetate.** $Mn(C_2H_3O_2)_2.2H_2O$.

**Manganese Carbonate.** $MnCO_3$.

**Manganese Dioxide.** $MnO_2$; black oxide.

**Permanganate of Potassium.** $KMnO_4$; permanganate of potash.

**Permanganic Acid.** $HMnO_4$; hydrogen permanganate.

MERCURY COMPOUNDS (QUICKSILVER)

There are a large number of mercury compounds. I give only those of interest to the plater.

**Mercuric Chloride.** $HgCl_2$; corrosive sublimate; bichloride of mercury; perchloride of mercury.

**Mercuric Cyanide.** $Hg(CN)_2$; cyanide of mercury; bicyanide of mercury; prussiate of mercury.

**Mercurous Nitrate.** $HgNO_3$; subnitrate of mercury.

**Mercuric Oxide.** HgO; red precipitate.

**Mercuric Sulphide.** HgS; vermillion; red sulphide of mercury; cinnabar.

NICKEL COMPOUNDS

**Nickel Cyanide.** $Ni(CN)_2.4H_2O$; single cyanide of nickel.

**Nickel Sodium Cyanide.** $Ni(CN)_2.NaCN$; double cyanide of nickel.

**Nickel Acetate.** $Ni(C_2H_3O_2)_3$.

**Nickel Carbonate.** $NiCO_3$.

**Nickel Chloride.** $NiCl_2$.

**Nickel Fluoride.** $NiF_2$.

**Nickel Fluoride Ammonia.** $5NiF_26NH_3+8H_2O$.

**Nickel Hydrate.** $Ni(OH)_3$; nickelic hydrate.

**Nickel Oxalate.** $Ni(C_4H_4O_6)_2$.

**Nickel Oxide.** $Ni_2O_3$; peroxide of nickel; sesquioxide of nickel.

**Nickel Ammonium Sulphate.** $NiSO_4.(NH_4)_2SO_4.6H_2O$; double salts.

**Nickel Sulphate.** $NiSO_4.7H_2O$; single salts.

**Nickel and Potassium Sulphate.** Double sulphate of nickel and potassium.

PITCH COMPOUNDS

**Pitch.** Black pitch; boiled pitch; stone pitch; wood pitch.

**Burgundy Pitch.** White pitch; Burgundy resin.
**Canada Pitch.** Hemlock gum; hemlock pitch.
**Mineral Pitch.** Asphaltum; bitumen.

PLATINUM

**Platinic Chloride.** $PtCl_4$; cloride of platinum; perchloride of platinum; tetra-chloride of platinum.
**Platinum Ammonium Chloride.** $PtCl_2.2NH_4Cl$; ammonium chloro-platinate.
**Platinum Hydrate.** $Pt(OH)_4$.

PLUMBAGO

**Graphite.** C+impurities; black lead.

POTASSIUM COMPOUNDS

**Potassium Acetate.** $KC_2H_3O_2$; acetate of potash; diuretic salt.
**Potassium Carbonate.** $K_2CO_3$; salt of tartar (pearlash impure).
**Potassium Bicarbonate.** $KHCO_3$; potassium hydrogen carbonate; acid potassium carbonate.
**Potassium Cyanide.** KCN; cyanide of potash.
**Potassium Ferricyanide.** $K_3Fe(CN)_6$; red prussiate of potash.
**Potassium Ferrocyanide.** $K_4Fe(CN)_6.3H_2O$; yellow prussiate of potash; ferro-prussiate of potash.
**Potassium Hydrate.** KOH; caustic potash; hydrated oxide of potash.
**Potassium Nitrate.** $KNO_3$; nitrate of potash; saltpeter.
**Potassium Binoxalate.** $KHC_2O_4$; salt of sorrel; essential salt of lemons.
**Potassium Sulphate.** $K_2SO_4$; normal potassium sulphate; vitriolated tartar.
**Potassium Bisulphate.** $KHSO_4$; potassium hydrogen sulphate; acid potassium sulphate; bisulphate of potash.
**Potassium Sulphocyanide.** KCNS.
**Potassium Tartrate.** $K_2C_4H_4O_6$; soluble tartrate; neutral tartrate; tartrate of potash.
**Potassium Bitartrate.** $KHC_4H_4O_6$; (argols impure); cream of tartar; crystals of tartar; acid tartrate of potassium.

SILVER COMPOUNDS

**Silver Chloride.** AgCl.
**Silver Cyanide.** AgCN.
**Silver Nitrate.** $AgNO_3$; lunar caustic.
**Silver Oxide.** $Ag_2O$.
**Silver Sulphide.** $Ag_2S$; sulphuret of silver.

SODIUM COMPOUNDS

**Sodium Carbonate.** $Na_2CO_3$; sal soda; soda crystals; washing soda.
**Sodium Bicarbonate.** $NaHCO_3$; sodium hydrogen carbonate.
**Sodium Chloride.** NaCl; common salt; marine salt; muriate of soda.
**Sodium Fluoride.** NaF.
**Sodium Hydroxide.** NaOH; caustic soda; hydrate of soda.
**Sodium Hyposulphite.** $Na_2S_2O_3.5H_2O$; hypo; sodium thiosulphate.
**Sodium Nitrate.** $NaNO_3$ cubic niter; Chilian saltpeter.
**Sodium Nitrite.** $NaNO_2$.
**Sodium Phosphate.** $Na_3PO_4$; tribasic phosphate of soda; tasteless salt; ortho-phosphate of soda.
**Sodium Acid Phosphate.** $Na_2HPO_4$ (dibasic); $NaH_2PO_4$ (monobasic).
**Sodium Pyrophosphate.** $Na_4P_2O_7.6H_2O$.
**Sodium Silicate.** $Na_2SiO_3$; water glass; soluble glass.
**Sodium Sulphate.** $Na_2SO_4$; Glauber's salt.
**Sodium Acid Sulphate.** $NaHSO_4$; nitre cake; bisulphate of sodium.
**Sodium Sulphite.** $Na_2SO_3$.
**Sodium and Potassium Tartrate.** Rochelle salts.

SULPHUR COMPOUNDS

**Liver of Sulphur.** Mixture of potassium polysulphides with potassium sulphate.
**Precipitated Sulphur.** Milk of sulphur.
**Sodium Polysulphides.** $Na_2S_2$; $Na_2S_3$; $Na_2S_4.6H_2O$; $Na_2S_5.6H_2O$.
**Sodium Sulphocyanide.** NaCNS.
**Potassium Sulphocyanide.** KCNS.
**Ammonium Sulphocyanide.** $NH_4SCN$. Used in oxidizing and black nickels.

TIN COMPOUNDS

**Stannic Acid.** $H_2SnO_3$; precipitated as a white powder.
**Stannic Chloride.** $SnCl_4$; bichloride or perchloride of tin.
**Stannic Oxide.** $SnO_2$; mineral cassiterite; tin stone; flowers of tin.
**Stannic Sulphide.** $Sn_2S_3$; used in bronze powders.
**Stannous Chloride.** $SnCl_2+2H_2O$; tin salt; tin chloride.
**Stannous Sulphide.** SnS; sepia powder.
**Stannous Oxide.** SnO; tin oxide.

ZINC COMPOUNDS

**Zinc Carbonate.** $ZnCO_3$; white powder.
**Zinc Chloride.** $ZnCl_2+H_2O$; muriate of zinc.
**Zinc Cyanide.** $Zn(CN)_2$.
**Zinc Oxide.** ZnO; zinc white.
**Zinc Sulphate.** $ZnSO_4+7H_2O$; white vitriol.
**Zinc Sulphide.** ZnS; zinc blende.

## Plating Problems

Q.—1. What is the carbonate of soda used for in copper? Could I make up a better solution for copper plating than the one I am using at present?

2. In nickel plating a cheap novelty that cannot be ball burnished or mechancally plated, how could I get an extremely bright nickel plate. Would it be practical to copper plate, then bright dip, then nickel plate for 15 or 20 minutes in a regular nickel solution? My nickel solution plates a pure white but not bright enough for this novelty.

3. How heavy can copper be deposited with the solution we are using? Is there a limit to the time and thickness of deposit before work or plate begins to blister? If so, how long is the time or how heavy the plate?

4. What effect has ammonia upon the copper plating solution?

A.—Carbonate of soda is a conductor to some extent. Bicarbonate of soda is better and bisulphite of soda surpasses all for copper, brass, bronze and ever. gold solutions.

It would be far better to tumble the copper plated articles in sole leather chips, using white diamond polishing composition reduced to a powder, and mixed with benzine as the polishing medium. Only very little would be required. The articles would have the appearance of buffed work.

After nickel plating treat the articles the same way. An excellent finish should result. There would be no advantage in bright dipping, and much more metal would have to be deposited to overcome the action of the acid dip.

Use the method outlined if the articles cannot be ball burnished.

A properly prepared copper solution should not develop blistering, if the current used is not excessive, even when the articles are plated several hours.

Ammonia should not be used in copper solutions. It gives no beneficial results. C. H. P.

# Electric vs. Crucible Furnace

## A Continuation of the Discussion Begun in Our June Issue

### DR. GILLETT'S OPINION

To the Editor of THE METAL INDUSTRY:

I have your request of June 15 for comments on Mr. Eastick's letter on page 241 of your June issue.

The early form of the General Electric furnace did develop some troubles with the lining, but as the later form is an improvement worked out on the basis of information obtained by the use of the early form, it may be expected to do better. Mr. Eastick's opinion may be correct, but until operating data on the new form becomes available, it is an opinion only. I do not care to express an opinion until I have some facts to base it on.

Mr. Eastick's idea that an electric furnace using 270 K.W.H. per ton has a "poor showing" against coal or oil is based on but one chapter of the story. Power or fuel is but one item of melting cost among many, and to leave out crucible cost, melting losses, labor costs, etc., in a comparison is unsafe, as it gives thinking foundrymen the impression that one who makes such a sketchy comparison deliberately does so because a full tabulation of all the items would prove something he didn't want to prove.

Mr. Eastick is decidedly and fundamentally in error in his ideas on volatilization of zinc. Temperature and time, which he states are the only factors governing zinc loss, are far from being the only factors.

If one puts a wet sponge in a humidor that is tightly closed, the vapor space becomes saturated with water vapor, the amount of water vapor in the vapor space depending on the temperature. If there is no leak the sponge will stay wet forever.

If the humidor is not tight, water vapor will slowly leak out and the sponge will dry out in time, but slowly. If the sponge is placed in a strong draft, say in front of an electric fan, it will dry out much more rapidly—just as clothes on a line dry faster on a windy day.

The evaporation of water below its boiling point is exactly analagous to the evaporation of zinc from molten brass below its boiling point.

Zinc vapor is rather heavy and its rate of diffusion in the absence of a draft, is slow. All electric brass furnaces are run either tightly plugged up, so that the pressure of the furnace atmosphere is above the outside atmospheric pressure or else are run with only small openings. There is no current of moving gas sweeping over the surface of the melt.

**The rate of displacement of zinc vapor** is a factor in zinc losses which Mr. Eastick entirely overlooks, and which is the key to the fact, disputed by Mr. Eastick, but a well-established fact just the same, that electric furnaces, in which the rate of displacement is zero or very small, show smaller zinc losses than do fuel-fired furnaces in which the stream of products of combustion sweep out the zinc more or less rapidly, according to the type of furnace.

A crucible furnace, with a tightly fitting cover on the crucible would lose no more zinc than an electric furnace; but nobody uses crucible covers because they slow up melting.

A charcoal cover or a slag cover on a crucible does not wholly prevent the escape of zinc vapor from the melt, and as soon as the vapor escapes into the space above the crucible it is swept away, more or less rapidly, according to the volume and velocity of the gases passing through the furnace. An open-flame or reverberatory furnace, with its large surface of melt, and high velocity of gases over the melt, sweeps out zinc vapor rapidly. Holding a heat of yellow brass in an open flame furnace after it is ready to pour causes rapid zinc loss, while in a tightly closed electric furnace it causes no zinc loss.

On yellow brass, any suitable electric furnace properly operated will theoretically, does experimentally, and does commercially, give lower zinc losses than any fuel-fired furnace properly operated. Careless operation of the fuel-fired furnaces gives worse results than careless operation of electric furnaces.

Moreover, not all metal losses are due to volatilization.

In crucible practice, metal is spilled into the ashes, crucibles break and leak, and there is a loss in the recovery of metal from ashes, which is not met in electric furnace or open-flame practice. There is greater oxidation and slagging of metal in average open-flame practice on red brass and bronze than in average electric practice, because of the oxidizing effect of the excess air over that theoretically required for combustion in the open flame. It therefore turns out that electric melting reduces metal losses, not only on yellow brass, but on red brass and bronze as well.

There are so many factors affecting metal losses that any figure, ranging from the 1/100 of 1 per cent loss on remelting silver dollars in an electric furnace at the United States Mint to the 8 per cent figure on brass, cited in the article Mr. Eastick is criticizing, must be considered in relation to these factors.

Melting ingot bronze is one thing, and melting dirty yellow grindings is another. I have seen lots of the latter that I doubt if Mr. Eastick could melt with less than 8 per cent loss of metallics. Mr. Eastick is correct, however, in criticizing an 8 per cent figure given without explanation of the analysis and condition of the material.

I have covered the question of over-all efficiency of the electric furnace from coal to metal melted in my previous letter on page 240 of your June issue.

Of the three electric furnaces which are doing the bulk of the electric brass melting, the Ajax-Wyatt, Detroit Rocking, and the Baily, the first two were designed by metallurgists and foundrymen with the aid of electrical engineers and the last reached its present form through a long series of trials and development in the foundry. There are places where an oil lamp and an electric light, a coke furnace and an electric furnace are all useful and it is as logical to condemn (or to commend) an electric furnace because it is an electric as to condemn an electric light because it is electric.

H. W. GILLETT, Chief Alloy Chemist,
Ithaca, N. Y., June 20, 1921. U. S. Bureau of Mines.

### MR. EASTICK'S OPINION

To the Editor of THE METAL INDUSTRY:

It is very gratifying to have prompted such an authority on the subject as Dr. Gillett to contribute to the discussion of the merits and limitations of electric furnaces for brass melting. Nothing but good can come of thorough airing of the question in that, at least, the prospective buyer of brass melting equipment will very likely obtain more data than he now has and will probably be so much more cautious in making his decision.

I am indebted to Dr. Gillett for his correction in regard to "load factor," which is acknowledged with thanks.

It was to have been expected that Dr. Gillett would agree with the more obvious of my points in regard to cost of power, operating efficiency of furnaces and the necessity for taking account of interest and depreciation with electric furnace installations.

Dr. Gillett says in his opening paragraph that my argument is based on conditions in so small a rolling mill as

not to be able to utilize regularly a one-ton furnace and that such rolling mills are "no 'count" anyway. I disagree with this idea altogether. There are plenty of brass mills which are paying dividends both in the United States and Europe with an average monthly production of 500,000 pounds and even less, and which are called upon to supply such a variety of alloys and products that they could not keep a one-ton furnace operating continuously, which is necessary, as Dr. Gillett practically admits, if it is to show savings.

Dr. Gillett seems to be over-impressed with the bigness of the "big fellows." During the war very exceptional conditions prevailed in the brass rolling mill business. Immense orders for a single alloy were the order of things; contracts for cartridge brass of such a size that the plant could operate 24 hours a day, 7 days a week, for months, and similar contracts for extruded brass rod were common. Where such conditions as these obtain, I am perfectly willing to admit that on account of the present backward development of gas applications in the brass and copper industry, electric melting undoubtedly shows savings over crucible melting.

Those days are, fortunately, over and we are rapidly getting back to a normal state of affairs, and unless I am very much mistaken, the "big fellows" are just as keen after the 500-pound orders for special alloys as they were before the war. It seems evident that many of them will find their electric melting installations designed for large production, somewhat of a white elephant.

I have never asserted that electric melting could not show savings over crucible melting under conditions which I think Dr. Gillett has in mind, i. e., very large production on a standard alloy, but such conditions as these are by no means the rule in the brass and copper industry in normal times and even where they are, some type of oil- or gas-fired tilting crucible furnace offers practically as many advantages as do most of the electric furnaces now on the market.

Dr. Gillett's opinion that "small" foundries which cannot utilize fairly steadily a ton or at least a half-ton furnace, may not be able to save money by electric melting is very interesting. He must agree that under conditions where the "large" foundry is called upon to produce small orders for a variety of alloys, the same opinion holds.

I had no idea of suggesting that small foundries should install gas plants. What I did try to convey was that small shops should either stick to coal pit furnaces, or buy oil or gas; the type of furnace to depend on conditions, of course, whereas those shops where the production warranted the cost of installation would do well to investigate the possibilities afforded by a gas plant of some sort.

It would seem to the writer that Dr. Gillett's analogy regarding the woods and the trees, is capable of the reverse English when applied to his argument, in that it is possible that he cannot see the 90 per cent trees for the 10 per cent woods. By this I mean that Dr. Gillett urges the use of electric furnaces where large production of standard alloys is required, and in such cases many will admit that he has some argument. But such cases, as mentioned above, are by no means the rule and the average shop should select equipment which will be adaptable to more general and varied requirements instead of a large expensive installation which must be operated 16 hours a day on one or at most two standard alloys before any material saving can be shown.

My figure of 1.3 per cent zinc loss is not exaggerated and there are many mills where this figure is attained. It is not the result obtained on a test with careful operation, but was every-day practice.

Dr. Gillett takes my figures and juggles them about in fearful and wonderful fashion and of course the cellulose-graphite method of proving a contention can be practiced by anyone. Without indulging in any more figures allow me to point out that on 24-hour operation, the crucible method would also show certain reduction. For example, crucibles would last fully 25 per cent longer with continuous operation and less coal would be used on account of elimination of the daily heating up of the furnace work. Aside from this, however, it should be remembered that the shop with the crucible furnaces can put through small orders for various alloys and can change over from one mixture to another at a moment's notice with no loss of time, waste of fuel and scrap due to "washing" out the furnace, etc., and in general enjoys many advantages due to flexibility over the electric melting shop. These advantages cannot be shown on paper, but any mill or foundry superintendent will appreciate how important they are.

My remarks on the conservation of fuel were made in connection with gas application and, not wishing to drag this letter out too long, I will merely say that Dr. Gillett's figure of 600 pounds of bituminous coal per ton of brass melted with electric furnaces, is not in the running with gas melting. Six hundred pounds of bituminous coal converted into gas of calorific value of 300 B.T.U. per cubic foot should melt from one and a half to two tons brass in crucible furnaces and will do it with a much less expensive plant.

However, the subject of fuels for furnaces is a big one which cannot be generalized on, nor can it be settled by a few catch words and figures. Location of plant, transportation, material to be melted, and production required are among literally hundreds of factors to be considered. It is these factors that require study by the furnace engineer referred to in the May letter. It was not intended to imply that the furnace engineer should necessarily originate a new furnace; in many cases a satisfactory standard type furnace can no doubt be bought, particularly on small jobs, but the selection of furnace, of fuel, installation, and minor changes necessary to adapt it to conditions should be left to the furnace engineer and the metallurgist.

THOS. H. A. EASTICK.

Montreal, Canada, June 30, 1921.

## Foundry Mixtures

**Horse Bits**

| | |
|---|---|
| Copper | 10 lbs. |
| Nickel | 5 " |
| Aluminum | 7 oz. |

**Key**

| | |
|---|---|
| Copper | 80 lbs. |
| Tin | 10 " |
| Zinc | 5 " |
| Lead | 5 " |

**Gold Metal**

| | |
|---|---|
| Copper | 1 lb. |
| Tin | 1½ " |
| Lead | ½ " |
| Zinc | ¼ " |

**Name Plate Metal**

| | |
|---|---|
| Copper | 90 lbs. |
| Tin | 8 " |
| Zinc | 2 " |

**Oreide Metal**

| | |
|---|---|
| Copper | 1 lb. |
| Zinc | 1½ oz. |
| Tin | ½ " |
| Lead | ½ " |

**Piston Rings**

| | |
|---|---|
| Copper | 16 lbs. |
| Tin | 2¼ " |
| Zinc | 2 oz. |
| Lead | 2 " |

**Pump Metal**

| | |
|---|---|
| Copper | 1 lb. |
| Tin | 1½ oz. |
| Zinc | ½ " |

**Steam Metal**

| | |
|---|---|
| Copper | 15 lbs. |
| Tin | 1 " 6 oz. |
| Zinc | 3½ " |
| Lead | 7 " |

# Iron-Pot Melting Practice for Aluminum Alloys[1]

**A Series of Articles Giving a Complete Survey of Present Day Methods in General and a Detailed Investigation of Iron-Pot Practice in Particular. Part 3.**

By ROBERT J. ANDERSON[2]

## DETAILS OF THE CONSTRUCTION OF IRON-POT FURNACES

Roughly, a single-unit iron-pot furnace is built by lining a suitable iron shell with refractory brick and suspending from the top a cast-iron pot. A single burner is placed near the bottom and at one side of the shell, and the pot is heated over its exterior surface by the combustion of the fuel. The products of combustion are permitted to escape through a vent near the top and at the side opposite the burner. In the case of single-unit stationary furnaces, the furnace shell may be either circular or square in shape when circular pots are used; when rectangular pots are used, the shell is rectangular. Circular pots are always used in tilting furnaces, and the furnace shell is circular in shape. In the case of the multiple-unit furnaces using circular or rectangular pots, the furnace shell is always rectangular in shape. The flue or vent for most stationary and tilting furnaces is placed near the top and at one side of the furnace, and this may be connected to a stack to lead the products of combustion outside the melting room. In some tilting furnaces, vent holes are placed at the top of the furnace around the flange of the iron-pot, but usually when this is done the furnace is run with a cover. The furnace shell may be made of steel boiler plate or similar material, and the lining is generally high grade firebrick. Oil and related liquid fuels and gaseous fuels such as natural gas, illuminating (city) gas, and producer gas are used for the fuel in iron-pot furnaces, although oil is the preferred fuel.

In a general way, it may be said that the available volume for the combustion space will vary depending upon the type of burner, but Fig. 1 will give an idea of the construction of a single-unit stationary iron-pot furnace. There should be allowed about 8-10 inches between the bottom of the iron pot and the furnace bottom so that the hottest portion of the flame will not impinge directly upon the pot. The burner should project the flames tangentially so that they will rotate around the pot. As has just been indicated, the volume of the combustion space, the location of the burner and of the vent will depend upon the type of burner used. Where a burner using high pressure air and giving a long narrow flame is used, the burner should be placed outside the pot, as indicated in Fig. 1. Where a burner using high pressure oil and low pressure air is used, giving a short, thick flame, this arrangement of the burner is not necessary. The type of burner used will govern also the mode of installing it. Some burners should fit tightly into the burner opening in the furnace wall, and take in no outside air except that supplied through the burner. Other burners should be fitted in with a sleeve valve containing slot openings so that the amount of outside air drawn in can be controlled by regulating the valve. Other burners should project the flame in through a hole in the furnace wall as indicated in Fig. 1.

Better distribution of the flame around the pot would probably result by placing several small vents around the flange of the iron pot in the roof of the furnace. This design is, however, not often used because difficulty is had in disposing of the products of combustion, and the top of the furnace becomes very hot, thus making work around the furnace unnecessarily hot. From the standpoint of the furnace tender, i.e., as to working conditions imposed by the heat, one vent in the side of the furnace near the top will discharge the products of combustion satisfactorily. Of course, in some installations, flues and stacks are used for leading off the waste gases. This would appear to be safer practice because when the furnace is run with a reducing flame a considerable amount of carbon monoxide is discharged into the air of the melting room, and, on the basis of toxicity tables for the effect of this gas upon man, a real danger exists.

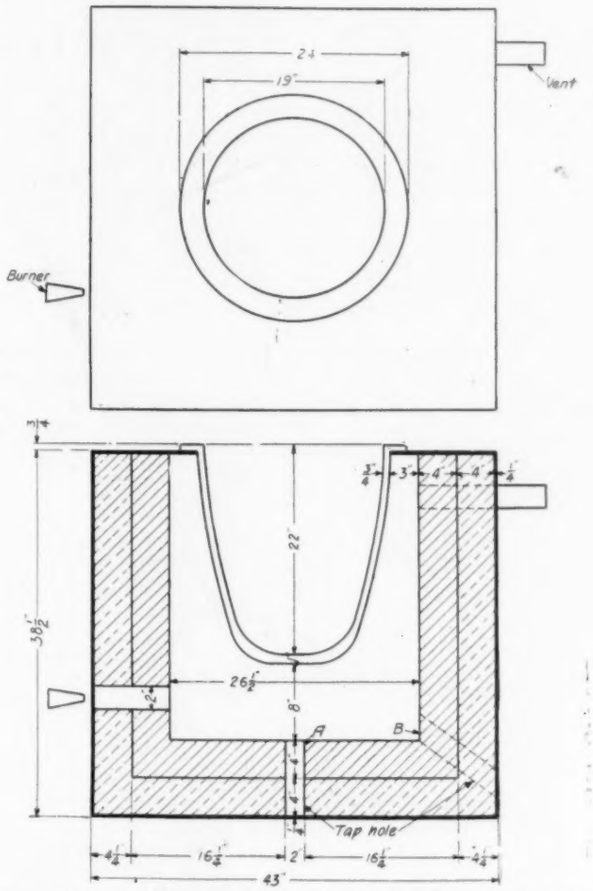



FIG. 1. TOP VIEW AND CROSS SECTION OF A SINGLE UNIT STATIONARY IRON-POT FURNACE

It is of interest in this connection to point out that the size of flue (vent) has an important effect upon the fuel efficiency, and the data given in Table 1 may be examined in support of this view.

The tests summarized in this table were made upon an installation of oil-fired stationary iron-pot furnaces in a

[1] Published by permission of the Director, U. S. Bureau of Mines.
[2] Metallurgist, U. S. Bureau of Mines, Experiment Sta., Pittsburgh, Pa. Parts 1 and 2 were published in May and June, 1921.

large automotive foundry. It will be seen from the results that a saving of about 40 per cent in the oil consumption can be made by decreasing the size of the flue opening in the furnace. Thus, with a flue opening 26 by 5 inches, 55.2 pounds of metal was melted per gallon of oil; with a flue opening 8 by 5 inches, this was increased to 77.0 pounds of metal per gallon. No. 12 alloy was melted in these tests.

TABLE I.

Effect of size of flue in iron-pot furnaces upon the fuel consumption.[15]

| Size of flue, inches. | Number of runs. | Pounds of metal melted. | Time of run, minutes. | Oil used, gallons. | Metal melted per gallon of oil, pounds. | Metal melted per hour, pounds. | Oil consumption per hour, gallons. |
|---|---|---|---|---|---|---|---|
| 26. x 5..... | 2 | 5,479 | 452 | 99.2 | 55.2 | 727 | 13.11 |
| 8. x 5..... | 1 | 5,100 | 440 | 66.2 | 77.0 | 690 | 9.03 |
| 6. x 5..... / 4. x 5..... | 2 | 5,574 | 464 | 70.8 | 78.8 | 720 | 9.12 |

The furnace should be provided with a hole in the bottom (A, Fig. 1) or on the side (B, Fig 1) which can be quickly unplugged so that metal can be drawn out in the event that a pot breaks. Or the hole may be left open

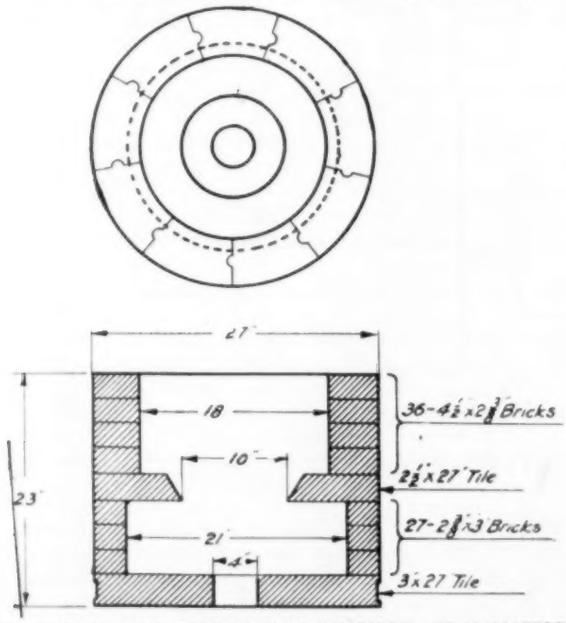



FIG. 2. LINING AND COMBUSTION CHAMBER OF HAUSFELD TILTING IRON-POT FURNACE, 100-LB. CAPACITY

all the time. Most of the commercial iron-pot furnaces are not insulated, but if a layer of infusorial earth, or a course of insulating brick, is placed between the firebrick lining and the iron shell of the furnace, much less heat will be lost through the shell, and greater fuel efficiency will obtain. In the case of old installations which are not insulated, the shell may be painted white, or given a coat of aluminum paint; if the outside of the shell is kept white or bright, the heat loss will be reduced[16] slightly. Taking up now the construction of typical commercial makes of iron-pot melting furnaces, it is sufficient for the purpose of the present series of articles to consider two furnaces which are on the market, viz., the Buckeye furnace and the Hausfeld furnace. The principal features of the construction of these furnaces are considered below.

Fig. 2 shows the arrangement of the lining and combustion chamber of the Hausfeld tilting iron-pot furnace of 100-pounds capacity, while Fig. 3 is a photograph of the furnace in pouring position. Wedge-shaped refractory tile are used for supporting the pot, as shown in Fig. 2. A photograph showing the shape of the iron pot used is shown in Fig. 4. This furnace is of the tilting type and is built in two regular sizes, viz., 100-pounds

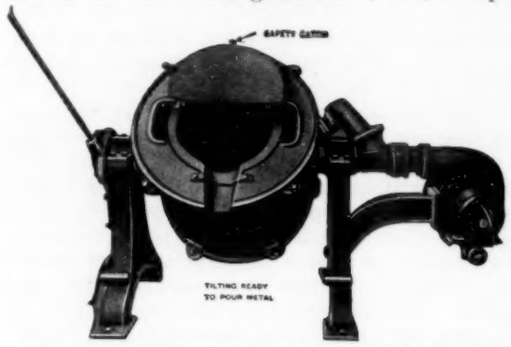



FIG. 3. HAUSFELD TILTING IRON-POT FURNACE

and 300-pounds capacity. The lining is made of machine-pressed high refractory brick, and consists of one bottom brick, one muffler brick with a 10-inch hole, 36 4½ by 2⅜-inch brick, and 27 3 x 2⅜-inch brick. About 75 pounds of high temperature cement are used in putting up the lining. The furnace is to be run with a cover. The cover swings back, as shown in Fig. 3, and may be held in the open position for pouring by a safety catch. For the 100-pound pot the outside diameter of the flange is 17 13/16 inches, and the outside diameter under the flange is 15 13/16 inches; the overall depth is 14¾ inches. This pot weighs about 100 pounds. For the 300-pound pot the outside diameter of the flange is 23⅛ inches, and the outside diameter under the flange is 20⅛ inches; the overall depth is 15⅝ inches. This pot weighs about 225 pounds. For both sizes of pots, the average thickness of the side walls is ¾ inch, and the bot-


FIG. 4. IRON POT FOR HAUSFELD TILTING FURNACE

tom is ⅞ to 1 inch. These furnaces may use natural or artificial gas, fuel oil or kerosene as the fuel, and are equipped with Maxon-Premix burners. The fuel consumption is stated to be as follows:[17] For the 100-pound furnace, 4 gallons of fuel oil per hour, 600 cubic feet of natural gas, or 850 cubic feet of artificial gas per hour. The fuel consumption on the 300-pound furnace is stated to be about 50 per cent more than on the 100-pound furnace. When using oil as the fuel, the air pressure at the burner is about 4 ounces, and the oil pressure is 40

[15] Reported from a foundry test.
[16] (Private communication. H. W. Gillett, January 16, 1920.)
[17] Private communication, J. S. Armour, June 29, 1920.

pounds. When using gas as the fuel the air pressure at the burner is about 4 ounces, and the oil pressure is 4 ounces.

When starting with a cold furnace, it is stated that the first heat, on the 100-pound furnace, requires about one and one-half hours, and additional heats require one hour when the furnace is run continuously. The time required for the first heat, on the 300-pound furnace, is one and three-quarters hours, and successive heats require one and one-quarter hours. Seven or eight 100-pound heats can be obtained per eight-hour day, using a molten heel in the pot, with a fuel consumption of about 4.5 gallons of oil per 100 pounds of metal melted. The furnace may require relining twice per year when it is run continuously. From 50 to 55 heats can be obtained per pot. Three furnaces require one furnace tender.

The Buckeye stationary iron-pot furnace is typical of the standard furnaces of the stationary design which are on the market. This furnace is built in one size, the pot having a capacity of 275 pounds of metal. The iron pot is suspended in a cast-iron ring, and a combustion space is provided at the bottom of the furnace; this space is of such size, and is so arranged that the flame from the burner does not come into direct contact with the pot. The flame enters the furnace tangentially and swirls about the bottom of the combustion chamber. The principle of melting is substantially as follows: The heat from the flame is transmitted to the refractory lining which extends from the bottom to the top of the furnace, and the heat is then radiated from the lining to the pot. A small flue is provided at the extreme top of the furnace through the lining to permit the escape of the products of combustion. The furnace shell is circular, and oil or gas may be used for the fuel.

In small foundries, or where the output of aluminum alloys is only a small part of the total production, one or two small stationary or tilting iron-pot furnaces may be installed. In large foundries, reverberatory and stationary open-flame cylindrical furnaces are being more favored now, but in the majority of these foundries it is usual to find a battery of stationary or tilting iron-pot furnaces.

### OPERATING DETAILS OF SOME IRON-POT FURNACE INSTALLATIONS

The general and detailed construction features of iron-pot furnaces have been considered in preceding paragraphs of the present series of articles, and it is the writer's intention here to present some data with regard to the constructional features and operating detail of a number of typical furnace installations. These data were, in some cases, reported by foundries to the Bureau of Mines; in other cases, they were obtained from furnace makers; and some have been obtained from other sources. These data are of value principally because they reflect actual working practice rather than ideals, and they may be considered, therefore, as representing present practice in representative American foundries. The following data are for No. 12 alloy, but it should be borne in mind that some other light alloys are melted in iron-pot furnaces. The light aluminum-copper alloys, principally No. 12 and related alloys, make up about 97 per cent of the total output of aluminum-alloy castings produced in the United States, and consequently information bearing upon the melting of these alloys is much more important than of other light alloys.

**This series will be continued in our subsequent issues.—Editor.**

# Early Days in the Brass Industry

## No. 3. Reminiscences of a Brass Man Who Remembers Old Times*

**Written for The Metal Industry by THOMAS R. TAYLOR**

I have written a few letters for THE METAL INDUSTRY of the founders (as I personally knew them) of the Brass Industry, and now I am going to speak of the concerns, and those connected with them, who were the principals in making the Brass Industry in Waterbury and the country the success it is today. I will start with Waterbury Clock Company.

This was an outgrowth of Benedict & Burnham, organized in 1850 to use surplus stocks of brass, with Aaron Benedict, president; E. A. Lum, secretary, and M. Bailey, treasurer and selling agent. Mr. Lum retained his position for twenty years and was succeeded in 1872 by H. L. Wade, who brought this company up to its present greatness—**the largest and most successful clock company in the world.** It turns out 15,000 to 25,000 watches per day and more than 5,000 clocks per day. It stands at the top for best time and finish of any like industry in this country. The Chase family now control it, with a capital of $4,000,000, increased out of earnings since its organization, from $100,000 and given to the stockholders. G. M. Van Deventer is now sales manager and has been for 50 years. Not all old men are worthless, as this example proves.

The Waterbury Buckle Company is another of the early concerns that helped to make the brass industry successful. It was brought to its present standard through the hard work and determination of Earl A. Smith, who passed away a few years ago, but left a monument in this concern.

A man I wish to speak of in particular who did much to make the brass business and the Naugatuck Valley famous, was Henry A. Matthews. He first started making saddlery hardware in a small way with a very small capital in 1852, and in five years had cleaned up $200,000 and was one of the most talked of men in Waterbury. But he went in on a larger scale and went bankrupt. After a few years he got E. R. Lampson and W. E. Stanley to put up $35,000 and started the Matthews & Stanley Company, making saddlery hardware and stove trimmings. The latter item was his invention, and a great success. E. S. Willard, president of Holmes, Booth & Hayden, saw the opening, got in, changed the name to the Matthews & Willard Manufacturing Company, got into lawsuits over the McGill paper fastener and they failed. They were bought out by the Scovill Manufacturing Company and are owned and run by them today. After this failure Mr. Matthews was down and out, retiring on a small farm that his wife had inherited from her father. He spent his last days there, passing away about 5 years ago. His widow is still living—95 years old. His son, C. H. Matthews, was one of the organizers of the Ireland & Matthews Manufacturing Company, Detroit, Mich., and is one of the largest in its line in the country, employing 5,000 or more hands. Waterbury interests never gave H. A. Matthews credit for what he did and justly deserved.

*Previous articles appeared in our issues of May and August, 1920.

# Out of Date Patternmaking

## Antiquated Methods That Still Prevail in Many Shops

Written for The Metal Industry by WILLIAM H. PARRY

Up to a few years ago it was the universal custom to criticize the equipment and methods used in brass and iron foundries, and among their severest critics none were so prone to ridicule their efforts as the patternmakers, who furnished them with the chief means of producing castings. Possibly the patternmakers did not realize that they themselves were in a large measure responsible for that lack of progress by reason of patterns, improperly made or so out of date in their conception that the best molder on earth could not produce even a half a day's work while trying to make up for their shortcomings.

The old adage that "it isn't safe for parties living in glass enclosed porches to throw bricks at their neighbors" still holds good, and if there is any trade, vocation, profession or occupation, that is more hide-bound by tradition, precept, and practice, than that of the gentle art of patternmaking, it must be that of goldbeating as practiced in the time of Michael Angelo and today, without any change in method. The antiquated equipment used in even many of the so-called modern pattern shops of our era is still in evidence, and the number of thoroughly out of date shops is legion.

There is a reason for this state of affairs, and it is called self-sufficiency, which being liberally interpreted as applied to patternmakers, means that they are a law unto themselves, and brook no interference from anybody, especially molders. One would naturally suppose, now that the foundry industry is numbered as among the most progressive, that patternmaking would necessarily follow suit, but except in a very few isolated instances, such is not the case.

Perhaps the worst transgressors of the laws of progress are the jobbing pattern shops, particularly in and around New York City. A visit paid to any of them gives one pocketbook paralysis at the thought of being held up to pay a couple of dollars an hour for the labor toll, without the aid of up-to-date machinery, and, very often, no machinery, outside of a weak-legged lathe and an ancient circular saw with arbor bearings so worn and tables so out of true that they invite the operator to become a beneficiary forthwith under the state workman's compensation insurance act.

In a conversation with the owner of a good-sized jobbing shop held only a few days ago, a little quizzing brought out the fact that he knew nothing about production patterns, match plates, or pattern mounting, and had refused orders on such work, possibly because he supposed that they were some kind of a new breakfast food. It has been preached so often that most patternmakers are deficient in knowledge of up-to-date foundry practice, in fact, it has been more than hinted that they are not the unhappy possessors of any foundry knowledge, that I hesitate to add myself to the daily increasing throng that thrive on knocking patternmakers. But the truth must prevail, though the heavens fall, and most of them stand convicted as indicted and should be sentenced to serve a course in some correctional institution numbering a foundry among its other "attractions."

There is a term used in professional baseball circles which is applied to any team playing cut and dried baseball. It is called the "old army game." This appellation also lends itself to patternmaking as practiced in many shops, such as, for instance, one in Brooklyn, N. Y., where patterns are not allowed to be made so that three or more flasks must be used to mold them, it being the belief of the presiding genius of this shop that three part (or more) flash molding is **trick molding.** Of course there are many patterns that could be molded in two flasks instead of three or more, by the judicious use of cores, both dry and green sand, shell and skeleton patterns, pullbacks, drawouts, carrying plates, and so forth. But to attempt to set a rule by which all patternmaking must be guided is a fine example of the "old army game."

It would be a revelation to many of our seaboard patternmakers to visit a few modern Middle West pattern shops, not so much for the equipment study, as to look over the methods employed there in the making of production patterns. It may be argued that there is but little demand for this class of work on the Atlantic seaboard, and in a measure this is true, as, when such patterns are wanted, the Easterner goes West, for the reason that he can't get them East. Numbered among the customers of one jobbing shop located on the banks of the roaring Maumee River, in Toledo, O., are firms as far South as Georgia, as far West as California, as far East as Beantown, Mass., and many from New York and the vicinity thereof.

Just a few years ago a young man sought and obtained employment in an up-to-date pattern shop. As was the custom in that shop, he was given some simple work as a starter, and proved himself to be an intelligent and willing worker. In the course of time he was given jobs that would have satisfied the ambition of most patternmakers, but he realized that he was outside the pale of the favored crew of old employees, because his brand of patternmaking was as much different from theirs, as blacksmithing is to watch making. He was not discouraged, however, and at the first opportunity asked the foreman for a chance to tackle the hardest jobs, by which is meant those calling for the intimate knowledge of modern foundry practice, coupled with the last word in production patternmaking of the most complicated nature.

After unlearning about ninety-five per cent. of the knowledge (?) picked up in other shops, he did make good, but not without many falls by the wayside due to the fact that his knowledge of up-to-date foundry practice was nil.

The foreman of this shop took special delight in tutoring this young man, and was as proud of him as a hen with one chick when he announced that he was going home to teach his father and uncle what **real** patternmaking meant. The two aforesaid relatives were the owners of a foundry and pattern shop in a thriving town in Jersey.

Having no information further than that both of his relatives died within a year after his return home it is distasteful to think that he was in any way responsible for their deaths by poisoning their systems with up-to-date patternmaking practice, and failing to save them with the antidote of modern founding.

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### Correction

We regret to state that in our list of Aluminum Producers of the World, on page 190 of our May, 1921, issue, we omitted The Aluminium Corporation, Limited, of Dolganog, North Wales.

# THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulations





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## Contents

# EDITORIAL

## ELECTRIC FURNACES VS. CRUCIBLES

The discussion on electric furnaces as against crucibles is continued in this issue. Letters are printed from Dr. Gillett, and Mr. Eastick. Next month several additional letters will be published which could not be included in this issue. It is impossible to overestimate the value of thrashing out the matter in the open in this way. Everyone concerned must be careful of his statements to avoid being caught up by his opponents; each must be prepared to answer the most searching questions. The result is more light on the whole subject, which the user needs.

## GROWTH IN THE BRASS INDUSTRY

The recent United States census has brought out some interesting facts about the copper and brass industry. It grew tremendously between 1914 and 1919. Plants increased from 992 to 1119 (and we know that many of the old plants are greatly increased in size). Value of product increased from $162,199,000 to $487,707,000. Part of this was, of course, due to price inflation, but a large part was due to enormously increased production. A summary is given as follows:

| | 1919. | 1914. |
|---|---|---|
| Number of establishments | 1,119 | 992 |
| Value of products | $487,707,000 | $162,199,000 |
| Ingots and bars | 30,490,000 | 4,792,000 |
| Plates and sheets | 102,898,000 | 41,655,000 |
| Rods | 40,705,000 | 12,189,000 |
| Tubing: | | |
| Seamless | 37,531,000 | 10,269,000 |
| Brazed | 4,603,000 | 3,646,000 |
| Wire: | | |
| Plain | 33,933,000 | 13,487,000 |
| Insulated | 3,694,000 | 846,000 |
| Castings and machinery fittings | 130,736,000 | (1) 5,288,000 |
| Lamps | 1,559,000 | 1,127,000 |
| Electrical supplies | 38,396,000 | 1,524,000 |
| Other hardware and trimmings | 15,400,000 | 19,430,000 |
| Other manufactured products | 33,961,000 | 47,385,000 |
| Amount received for custom work and repairing | 5,874,000 | (2) |

(1) Includes aluminum castings only in 1914.
(2) Included with "all other" products in 1914.

Although such a statement has a brilliant appearance on paper, it really points out some of our present difficulties. It can be safely said that our capacity for production has been so greatly increased by war and post-war demands as to be too great for domestic needs. The most important aid to these industries seem to be export.

So far as business in general affects the metal industries, the outlook is only what might be expected under conditions as they have existed for the past year—neither better nor worse. A statement from the National Bank of Commerce, which sums up the situation concisely reads as follows:

> Sentiment with respect to business will naturally fluctuate in times like these. The reaction from the spurt in spring business has caused disappointment. The end of the premature revival in the automobile industry and the renewed downward movement in the prices of some commodities, notably sugar and petroleum, have been factors in bringing about a spirit of pessimism which is not entirely justified when the improvement in fundamental conditions is considered.
>
> On the other hand, it is unwise to expect other than quiet business during the summer months. Satisfactory recovery can come only after a protracted period, during which price liquidation must be completed as to manufactured and semi-finished goods and confidence in the future restored. Closely connected, too, with domestic business is the state of trade abroad and especially in Europe where political considerations must be a powerful influence in shaping the future. But in this direction also encouragement may be found in the fixing of a definite schedule of reparations payments as well as the now plainly discernible determination of most of the peoples of Europe to resume productive enterprise as rapidly as possible.

## PLATERS' CONVENTION

The American Electroplaters' Society has set an example in holding its convention during the last month to all other organizations, both business and technical. It took real courage to go ahead with their plans, as if business had been going on as usual, when everyone knows that business is not as usual. Moreover, the convention was managed by what was only a short time ago the Baby Branch, the Indianapolis group, almost every one of whom was on one committee or another. The report of the convention published elsewhere in this issue, shows how successfully they carried it off.

We like to think that this organization of electroplaters, not wealthy, not great in numbers, but rich in courage and confidence has shown the way. Mr. Servis' speech, in which he said:

> "Talk confidence, exude confidence, install confidence into every person we come in contact with. And why? Because confidence is the need of the hour. Confidence and optimism can dispel the clouds of depression that hang over us like a pall, and to us it should not be very hard to be optimistic with confidence to spare."

and followed it up with:

> "In one other way can we help, and that is by using every effort in our plants to produce at lower costs. The high cost of production in the immediate past was the result of the haste and waste of the war, and was carried on far too long after the war was over. As we near normalcy cost must come down, and we as a Society and as individuals must do our share toward bringing about that result. If we do not do our share, the result will be brought about anyway, and without our assistance; and that anything good should be done without our Society and ourselves doing our part is a thought that for members of this Society is unthinkable."

This stands out as truly representative of the spirit of the Society. Another representative statement is that made by C. H. Proctor, when he said:

> "That great and beloved American statesman, Theodore Roosevelt, said in one of his memorable speeches 'Every man owes some of his time to the upbuilding of the profession to which he belongs,' and I will add that you must put something more into your profession than what you take out, if you want that profession to grow and if you want to become a greater factor in that profession yourself."

It is upon this idea that the A. E. S. is founded and has grown.

Mr. Proctor also pointed out technical problems which had not yet been solved, such as spotting out, nickel on zinc plated steel, and so on. These unsolved problems, however, were not pointed out in a spirit of hopelessness, but rather with the idea of seeking out new fields to conquer.

And that is the spirit of the American Electroplaters' Society—the only organization of its kind. It is an association of men most of whom are untrained in any school except that of experience, and many, meagerly educated, but all of them sturdy, eager for knowledge and the chance to use, in the right way, the power that comes with that knowledge.

# CORRESPONDENCE AND DISCUSSION

**Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.**

**These letters were received in answer to requests for suggestions along the same line as those given in the editorial in our June issue, P. 250.—Ed.**

## NEEDS OF THE METAL INDUSTRIES

To the Editor of THE METAL INDUSTRY:

Replying to yours of 1st, please note the following replies to the three questions of your attached letter:

(1) Q.—Will you kindly state in what ways, as you see it, the Department could render greater service to the industry of which you are a member?

A.—An authentic record of stocks of raw materials on hand, copper, tin, lead and zinc.

**Standardized cost keeping methods**

(2) Q.—Can you also suggest any way in which the Department could be of further service to the Federal Government?

A.—Standardization and unification in so far as is possible for specifications covering engineering materials.

At the present time each Department has its own specifications; many of these although covering the same material are quite different in form and substances.

A reduction in the number of specifications by eliminating many that now differ slightly from each other.

(3) Q.—Have you in mind any direction in which the Department could be of further service to the Federal Government?

A.—No. That which benefits the industry as a whole, benefits each unit thereof.

G. H. CLAMER.

Philadelphia, June 3, 1921.

To the Editor of THE METAL INDUSTRY:

Probably the reason why you have not had more responses to your circular letter asking for suggestions as to how Secretary Hoover might best co-ordinate the diverse interests under his charge, and how, if in any way, his Department might be of benefit to us, is because Hoover himself, both in the conditions which he made when he accepted the post and by his subsequent acts and recommendations, has fully covered the field, as far as co-ordination and increased efficiency are concerned.

Furthermore, I happen to know from personal observation and personal contact with Mr. Hoover that he is bending his energies, with the full support of the President and the Secretary of State, toward the expansion, protection and simplification of foreign commerce. Through the communications of the State Department to Holland and other countries, it is shown that our Government intends to support our nationals in all legitimate extensions of their activities into foreign fields of production and of commerce. I know that efforts are being made to remove some of the hindrances to our entering foreign fields, reciprocally asking for suggestions as to how American laws or regulations might be modified to admit foreigners to a reasonable share in investment opportunities in the United States.

It is along such lines as these that I believe we all can best be helped, in spite of the fact that some domestic problems, like taxation, are crying out for settlement. Business revival, in my opinion, is to come only through international co-operation and good understanding; therefore, I end this note as I began it—the things which each of us would suggest have already been thought out and are being put in practice from Washington. So we can best help Mr. Hoover, in my opinion, by giving him unstinted praise for what he has accomplished and for what he is attempting, rather than by suggestion; for, excepting in some minor instances, he has thought out in advance whatever is essential.

New York, June 2, 1921. A. R. LEDOUX.

## NEW COPPER PRODUCTS

To the Editor of THE METAL INDUSTRY.

The lack of demand for copper and the critical condition of the unemployed miners in the copper regions has brought forcibly home to the minds of the people in these districts, the need of more diversified industry. With this aim in mind the commercial organizations in the copper country of Michigan entered upon a campaign by which they would increase the demand for their red metal in manufacturing circles and thereby speed up the re-employment of the miners, an event which can not take place before the present excess of copper is consumed.

Sifting out the many suggested inventions and picking out and developing the most probable ones these people have succeeded in making and marketing several articles made entirely of copper. One of these is a traveling bag or sample case such as is used by traveling salesmen. It is a neat case made of thin sheet copper, arranged with compartment of the same material. It is lightweight, durable and has a very neat appearance. Finished in a bright polish covered with a substantial lacquer these cases have already found their way into the life of many drummers and are performing the services formerly done by the leather case.

Another use of the metal is that of box making. A neat ornamental box has been made that is used as a candy container to replace the paper box which upon being emptied of the sweetmeats becomes useless. The copper box when filled with candy makes a very charming carrier and when the contents are emptied the box becomes a useful and handy case for any variety of household uses. Several candy manufacturers have contracted for these boxes and they are now making their appearance at retail houses.

An auxiliary automobile spring has also been made which consists of a copper strip about ⅛" thick made in lengths to fit the many makes of auto springs. This new leaf is built to fit between the leaves of the regular spring, and contains several holes punched through at intervals forming grease containers insuring perfect lubrication of the spring. The new leaf, being of softer metal and containing the lubricating cups, causes the car to ride with increased resiliency and prevents the squeak, so common to the car doing heavy and long duties.

Several other accessories and articles are being investigated and experimented with, and within a short time the people of this district expect to place many useful articles, made of their native copper, on the market.

San Francisco, Cal., June 10, 1921. G. T. MURPHY.

## THE TARIFF

To the Editor of THE METAL INDUSTRY:

The tariff bill just proposed by the Ways & Means Committee is the most unreasonable accumulation of greed ever submitted to any American Congress. Surely, it does not represent an attempt to reduce the cost of living or to stabilize industry and therefore, deserves and will receive a storm of condemnation that will not need an amplifier to be heard in Washington.

The Metal rates with few exceptions are absolutely prohibitive, and this Chinese Wall would be a joke as a revenue producer, but it will not be a joke to the American consumer who is waiting for a reduction in his expense account.

Wake up, Consumer, before it is too late, and send your protest to Washington.

New York, June 30, 1921. C. W. LEAVITT & COMPANY.

**In view of the numerous communications we have received concerning the Tariff, we give on the following page the items in the Fordney Bill of interest to metal trades.—Ed.**

# New Tariff Bill

The Fordney Tariff which has just come out of committee in the House of Representatives, includes items of interest to the metal industries and their allied and associated lines as follows:

| | New Bill | Present Tariff | Payne-Aldrich Tariff |
|---|---|---|---|
| Aluminum, Aluminum scrap and alloys, crude form | 5c per lb. | 2c per lb. | 7c per lb. |
| Aluminum, fabricated shapes | 9c " " | 3½c " " | 11c " " |
| Metallic Magnesium and scrap | $1.00 " " | ..... | ..... |
| Magnesium alloys, fabricated shapes and articles of Magnesium | $1.00 per lb. on the Magnesium Content, and 20% ad valorem | 10% | 20% |
| Antimony | 1½c | 10% | 1½c |
| German Silver, unmanufactured | 20% | 15% | 25% |
| Copper Wire not coated or covered, and copper wire and copper-clad wire, covered with tin | 1½c per lb. | ..... | ..... |
| Copper in rolls, rods, or sheets | 2½c " " | 5% | 2½c per lb. |
| Copper engravers' plates, not ground, and seamless copper tubes and tubing | 7c " " | ..... | ..... |
| Copper engravers' plates, ground, and brazed copper tubes | 11c " " | ..... | ..... |
| Brass wire, brass rods, sheet brass, brass plates, bars, and strips, Muntz or yellow metal sheets, sheathing, bolts, piston rods, and shafting | 4c " " | ..... | ..... |
| Seamless brass tubes and tubing | 8c " " | ..... | ..... |
| Brazed brass tubes, brass angles and channels | 12c " " | ..... | ..... |
| Bronze wire, bronze rods and sheets | 4c " " | ..... | ..... |
| Bronze tubes | 8c " " | 20% | 45% |
| Bronze powders, powdered tin, brocades, flitters, and metallics | 16c " " | 25% | 12c per lb. |
| Bronze or Dutch metal or aluminum, in leaf | 8c per 100 leaves | 25% | 6c per 100 leaves |
| Quicksilver | 7c per lb. | 10% | 7c per lb. |
| Nickel, nickel oxide, alloys of any kind in which nickel is the component material of chief value, in pigs or ingots, or similar forms | 5c " " | ..... | 6c per lb. |
| Nickel in bars, rods, plates, sheets, strips, strands, anodes, or electrodes | 30% ad valorem | Sheets or strips 20%, all other 10% | Sheets or strips 35%, bars, rods, plates, 35% |
| Tin in bars, blocks, or pigs, and grain or granulated and scrap tin | 2c per lb. | ..... | ..... |
| Lead bullion or base bullion, lead in pigs and bars | ..... | ..... | 2⅛c per lb. |
| Lead dross | ..... | ..... | 1½c " " |
| Reclaimed lead, scrap lead, antimonial lead, antimonial scrap lead, type metal, Babbitt metal, solder, all alloys or combinations of lead not specially provided for | 2⅛c per lb. on the lead contained | ..... | 2⅛c " " |
| Lead in sheets, pipe, shot, glaziers' lead, and lead wire, lead in any article or material not specially provided for | 2⅜c per lb. | 25% | 2⅜c " " |
| Zinc in blocks or pigs and zinc dust | 1⅜c " " | ..... | 1⅜c " " |
| Zinc in sheets | 1⅝c " " | ..... | 1⅝c " " |
| Zinc in sheets coated or plated with nickel or other metal, or solutions | 1¾c " " | ..... | 1¾c " " |
| Zinc, old and worn-out, fit only to be remanufactured | 1c " " | 15% | 1c " " |
| Provided, That for a period of two years beginning on the day following the enactment of this Act the rates of duty shall be as follows: | | | |
| On Zinc in blocks, pigs, or slabs, and old and worn out zinc fit only to be remanufactured | 2c " " | | |
| Zinc in sheets, plates, strips, or coils, plated with nickel or other base metals, or in fabricated form, and zinc dust | 2⅞c " " | | |

## NEW BOOK

**Gun Metal and Brass Founding, by H. S. Primrose, M. I. Met., A. I. Mech. Eng., and J. S. Glen Primrose, A. R. T. C., A. I. M. Met. Published by Louis Cassier Company, Ltd., 34 Bedford street, W. C. 2, London, England. Size, 4¾ x 7—279 pages. Price $3.25. For sale by THE METAL INDUSTRY.**

This book is written to cover a field in a way which it has seldom been covered previously, namely, from both the practical and the scientific angles. The authors, who are trained men, have had considerable experience in actual plant operation. The book is not over-elaborate, but is simply written and easy to understand.

Certain details might very profitably have been added, and others omitted. For instance, the authors stress, rather heavily, Wile's electric tilting furnace for gun metal, when it is a well-known fact that in this country the direct arc furnace has had comparatively small success in melting metals as compared with the indirect arc furnaces. This, of course, always bearing in mind the fact that the Rennerfelt furnace has a number of very satisfactory installations to its credit, but even the Rennerfelt furnace comes more under the head of indirect arc than direct arc furnaces. An unfortunate typographical error on page 36 gives the Wile furnace credit for melting gun metal at the rate of 70 kilowatts per ton, which is, to say the least, startling.

On page 40, the 5-ton air furnace for gun metal shown would be very much more useful if dimensions were included. Layouts like those given on pages 46-48 are excellent, but no mention is made of the fact that a new type of roof for foundries is coming into prominence, namely, the inverted truss (see THE METAL INDUSTRY, January, 1921, page 2-3).

On page 114 a melting flux is given, which, while not entirely new, is worth noting.

| | |
|---|---|
| Salt | 30 lbs. |
| Borax | 30 " |
| Charcoal | 30 " |
| Ground Glass | 10 " |

It is recommended that 4 ounces of this mixture is sufficient for a 100-pound charge of metal in the crucible.

Considerable space is devoted to metallographic work, which, although it may not appeal to the average foundryman, would be an excellent thing for him to study, as eventually it must appeal to him if he will continue to operate. A chapter on handling and melting scrap and swarf is another valuable addition. The book is filled out by three appendices on brass foundry cost systems, methods of chemical analysis and bare-wire pyrometry.

It is a very good book, particularly as it shows typical English foundry practice. There are probably a number of metallurgists in this country to whom this book will give little new, but to the vast majority who are not in touch with developments outside of their own locality, the book will be decidedly worth while.

# Technical and Scientific Literature

## Abstracts of Papers Read at the Thirty-ninth General Meeting of the American Electro-chemical Society, Held at Atlantic City, April 21-23, 1921

### PRINCIPLES OF ALLOYING TO RESIST CORROSION

By OLIVER P. WATTS.

A plea for intelligent use of metallography and metallurgical principles in attempts to find non-corrodible alloys. The general principle is laid down that the less corrodible alloys are either metallic compounds of simple chemical formula (which are apt, however, to lack malleability) or solid solutions of the more resistant metals in each other. The protective action of small amounts of one metal in another are described; an interesting test proving the protective action of copper in steel is given.

### THE CORROSION OF OLD IRON

By E. A. RICHARDSON and L. T. RICHARDSON.

Analyses are given of fifteen specimens of iron and steel which had been subjected to atmospheric corrosion for as much as 35 years. Five containing over 0.10 per cent. copper were all in good condition, five containing less than 0.10 per cent. copper were in fair to good condition, and five containing less than 0.10 per cent. copper were in poor condition; the results for over 0.10 per cent of copper are conclusive, for less than this amount contradictory. A two-years' test, comparing old iron with recently made iron, showed that irons made several years ago are no more rust-resisting than those made today.

### SOME OBSERVATIONS ON THE MECHANISM OF THE INCREASED CORROSION RESISTANCE OF STEEL AND IRON DUE TO SMALL COPPER CONTENTS

By D. M. BUCK.

A description of some tests on variations in corrosion with varying copper content. Tables and charts are also given.

### PHENOMENA OF ARC WELDING

By O. H. ESCHHOLZ.

A detailed discussion of metal deposition, fusion and arc stability during electric welding. Under the first item, there are discussed the function of transport of metal by molecular forces, effect of evolution of gases, and vaporization or condensation, with the conclusion that the molecular forces play the main part. Under fusion are considered the effects of impact of ions, atmospheric convection currents, sudden liberation of gases, and combination of material with oxygen and nitrogen. Arc stability is discussed from the standpoints of long and short arcs, constant potential circuits, use of ballast resistance, etc.

### ELECTROLYTIC CORROSION OF LEAD BY CONTINUOUS AND PERIODIC CURRENTS

By E. R. SHEPARD.

1. The results of these experiments agree generally with those obtained by McCollum and Ahlborn, with the exception, however, that in earth, under favorable conditions, with continuous current, a coefficient of corrosion of 100 per cent. was obtained. The low value reported by McCollum and Ahlborn was undoubtedly the result of using a lower moisture content than that employed in this series, and not tamping the earth around the electrodes.

2. With continuous current, the coefficient of corrosion in both tap water and earth decreases with an increase in current density, reaching a minimum of about 50 per cent. for current densities of 5 milliamperes per square centimeter. The theoretical maximum value of 100 per cent. was found for low-current densities of the order of 0.5 milliampere per square centimeter and less.

3. The coefficient of corrosion drops off rapidly as the moisture content of earth is decreased below the saturation point. For 40 per cent. moisture content and greater, if the earth is well tamped about the specimens, the full theoretical amount of corrosion occurs.

4. The coefficient of corrosion of lead in tap water decreases with time, but little or no decrease in the coefficient is observed with specimens in saturated earth.

5. With periodically reversed currents in which the anodic and cathodic conditions are equal, that is, when the algebraic average value of the ampere-hours is zero, the coefficient of corrosion based on the anodic current, decreases rapidly with time, reaching a value of about 14 per cent. after 465 hours in saturated earth and about 50 per cent. in tap water.

6. The coefficient of corrosion increases with the percentage of the total ampere-hours contributing to an anodic condition.

### SOME TYPES OF NON-FERROUS CORROSION

By H. S. RAWDON.

Although fundamentally similar, the author discusses structural changes caused by corrosion of non-ferrous metals as four distinct types, namely (a) Selective attack of certain constituents, (b) Intercrystalline brittleness, (c) Internal oxidation, (d) Simultaneous action of stress and corrosion. As examples of each type the following are given: (Type a)—Brass (60 per cent. Cu 40 per cent. Zn) was exposed to sea water for 7 years. The $\alpha$ constituent (65 per cent. Cu) was untouched, while the $\beta$ constituent (50 per cent. Cu) was corroded by a leaching out of the Zn (Type b)—Cable sheath of Pb exposed underground became brittle due to the destruction of the intercrystalline material (usually non-miscible impurities such as Fe, Cu, Ni, Zn, or miscible eutectic-forming elements as Sn or Sb). This type of corrosion can be induced by immersion in lead-acetate solution. (Type c)—Boiler safety plugs of Sn deteriorated by change of metal to infusible oxide under influence of moist heat. The same type of change is found with Al-Zn (15 per cent.) alloys. In this case moist heat causes the oxidation and swelling of the eutectic matrix. (Type d)—Brass and lead under combined stress and corrosion will fail far below normal stress. This is due to selective corrosion of the $\beta$ constituent in the former, and to intercrystalline brittleness in the latter.

### THE CORROSION OF STEEL RANGES

By OLIVER W. STOREY.

The modern kitchen range is studied from the standpoint of the cause of corrosion to the steel in its various parts, and the seriousness of the corrosion. Experiments were made with copper-bearing and "Armco" sheet at points where corrosion was greatest, showing that the more copper contained in the sheet steel the less the corrosion. The economic importance of further researches in this line is pointed out.

## Abstracts of Papers Read at the Joint Discussion of the Faraday Society, the Institute of Metals and Other Societies at Storey's Gate, St. James Park, S. W. 1, England, April 6, 1921

### FAILURE OF LEAD SHEATHING

By L. ARCHBUTT

The failure of the lead sheathing of telegraph cables in service was caused by the cracks, intercrystalline in character.

Experiments were made by suspending sound lead sheathing with attached weights.

Experiments also showed the effects of vibration in producing surface markings and ultimate disintegration. Some fractures were intercrystalline and others not. The result of the observations was to support Dr. Rosenhain's theory of "an amorphous intercrystalline film capable of viscous flow under stress leading to a gradual separation of the crystals."

### THE MECHANISM OF STRESS CRACKING

Dr. W. H. Hatfield, of the Brown-Firth Research Laboratories, Sheffield, read a paper on "The Mechanism of Failure of Metals from Internal Stress." He argued against Dr. Rosenhain's amorphous film theory both in ferrous and non-ferrous metals.

### SEASON-CRACKING

Papers dealing with intercrystalline failures from the point of view of munitions of war, by Owen W. Ellis, entitled "Experiences of Season-Cracking During the Great War," and by W. C. Hothersall, "The Spontaneous Cracking of the Necks of Small Arm Cartridge Cases," were read. Both papers related to the work of the Royal Ordnance Department, Woolwich.

Experiments were carried out to overcome the evil of season cracking.

"A two hours' annealing at 200 deg. C. would be quite sufficient to remove all deleterious stress from such rod as was then being received into store. Since, however, the mechanical properties of the material were not affected in such a way as to render them outside the G specification by annealing at 400 deg. C., and since annealing at 350 deg. C. for about one-half an hour was found much the same in effect as the longer annealing at the lower temperature, this annealing temperature was employed in works practice and with success. As a result of this treatment many hundreds of rods, which otherwise would have failed by season-cracking, were passed into service. The success which attended the Ordnance Factories practice of low-temperature annealing was made known to certain of the manufacturers whose material had been the subject of investigation and it may here be worthy of note that the author knows that at least one of the firms notified of the successful issue of the above experiments in practive employed and is employing, where necessary, low-temperature annealing with equally good results."

Mr. Hothersall's conclusions about small arm cartridge cases and the tests to investigate the cracking were:

"The spontaneous cracking of the necks of small arm cartridge cases is due to the existence of stress in the neck of the case arising in some operation or operations subsequent to semi-annealing It is probable that the most fruitful sources of such stress are the necking and bulleting operations, though the indenting operation may set up sufficient stress to determine the position of formation of the cracks.

"The controlling factor which determines the amount of stress which becomes remanent in the brass during manufacture and thus becomes available for the formation of spontaneous cracks, is the hardness of the forward part of the wall of the case. The harder the brass, the greater the tendency for stresses to remain which may lead to spontaneous cracking.

"It appears probable that mercury derived from the cap composition may exert an important and even a determining influence on the formation, within the service life of the cartridge, of spontaneous cracks in the neck of the case."

### THE PREVENTION OF SEASON CRACKING IN BRASS BY THE REMOVAL OF INTERNAL STRESS

By H. MOORE and S. BECKINSALE

The rate of reduction of stress is fairly rapid at 200 deg. C. at first, but becomes very slow when the stress has been reduced to one-half to one-third its initial value and important stresses remain even after treatment for 24 hr. or longer.

As the temperature is raised the rate of reduction of stress increases, but shows the same characteristic of slowing down as the stress falls. At 300 deg. C. a very much shorter time is required to reduce the stress to a given figure than at 200 deg. C. and the remaining stress is much lower after a given time at the higher temperature, in brass of the same hardness.

The higher the initial stress, the higher is the remaining stress after a given treatment in brass of the same hardness, although the amount of stress removed is greater the higher the initial stress.

The higher the hardness of the brass, the lower is the remaining stress after a given treatment and for a given initial stress. In other words, the harder the brass the more rapidly is a given initial stress reduced at a given temperature.

A large reduction in the amount of stress is brought about by annealing conditions (temperature and time) which raise the hardness of cold-worked 70 : 30 brass, but treatments which result in some reduction of hardness are necessary to bring about complete removal of stress.

### NICKEL

Circular of the Bureau of Standards No. 100. Bureau of Standards, Washington, D. C. One of a series of circulars describing the physical properties of metals together with a discussion of the relation of these properties to the composition and treatment of the material. This one describes the properties of nickel and of its commercially important alloys: nickel-steel, ferro-nickel, copper-nickel and nickel-chromium alloys.

### METHODS OF CASTING MANGANESE BRONZE TEST BARS AS A CHECK ON MEETS OF SMALL CASTINGS

By E. H. DIX, JR.

A method is described in which a bar is cast, fed up by a wedge riser, joined to it by a ¼ in. web, which may be easily removed by an ordinary band saw. And further, the specimen is cast to the desired shape with just ⅛ in. machining allowance on the diameter. By this method it requires about 12 lb. of metal to cast a single specimen as compared with 33 lb. in certain other extreme methods. This method of casting is compared with several others including the A. S. T. M. method of cutting a test specimen from the ingot and also with a number of test specimens cut from actual castings.

It is concluded that the method described gives uniform and dependable results, which, while higher than the average result obtained from test specimens cut from castings is not as misleading as some in which excessive feeding is resorted to.

It is further shown that erroneous conclusions may be drawn if several different lots of metal are compared on the basis of an excessively fed cast bar, for a metal which may develop a very high strength and elongation with this feeding may not show up as well in commercial castings where the opportunity for feeding is of necessity limited. This paper was read at the A. S. T. M. meeting in Atlantic City, June 24.

### THE PRODUCTION OF HEAT TREATED PRODUCTS

A series of papers relating to principles governing industrial heating operations. The titles are as follows:

1. Factors governing quality and cost of heat-treated products.

2. Relation of temperature control to uniformly heated product.

3. Selection of furnaces.

4. Relation of price of fuel to cost of production.

5. The influence of furnace design on quality and cost of product.

This set of papers is published in one folder as Bulletin No. 230, by the W. S. Rockwell Company, 50 Church St., New York.

### THACHER MOLDING PROCESS FOR PROPELLER WHEELS AND BLADES

By ENRIQUE TOUCEDA, Albany, N. Y.

A paper to be presented at the Wilkes-Barre meeting of the A. I. M. E., September, 1921. This is a complete description of the methods used by Geo. H. Thacher & Company of Albany, N. Y., for making ship propellers, solid and built up type.

# SHOP PROBLEMS

**IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE**



## ALUMINUM ALLOY

Q.—We have received an order for some aluminum castings of the following composition: copper 6.0, iron .5, aluminum 94., manganese 3., silicon .5, tensile strength, 18,000 pounds; elongation 15 per cent in 2 inches.

Some time ago we had a similar order and had great difficulty in making it stand up. As we wish to make this time, could you advise us just what proportions will give us the best results.

A.—This alloy you are to use is a rather unusual one, and it will be difficult to secure good castings unless extra precaution is taken in melting and also in molding. In molding care must be taken to place risers and chills in the proper place. If this is the mixture you must use we would suggest that you make a hardener as follow: 54 pounds of 30 per cent manganese copper, 3 pounds of soft iron, 3 pounds of silicon, 40 pounds of aluminum. Melt the copper, add the silicon, then the iron and add 5 pounds of the aluminum. Stir the mixture well, then draw from the furnace. Place the 35 pounds of aluminum in an extra crucible or a heated iron pot, pour the copper on the aluminum, stir well and pour into ingots.

To every 82 pounds of aluminum add 18 pounds of hardener and 4 ounces of magnesium as a flux, also a small amount of chloride of zinc.—W. J. R. Problem 2,963.

## ALUMINUM CASTING

Q.—We are sending you a dome casting used for sweeper with which we have very much trouble. The surface of this casting looks perfect in the rough but after being roughed off shows small holes under the thin skin of metal. They are molded on a power squeezer with Albany molding sand and have about five inches of sand over the casting in the cope. Dry sand core is used, two being pasted together and are not vented. Castings are gated between the two and against the core. Place of gate is marked on sample we are sending you. No riser is used on this casting.

The metal we are using is 90 per cent. aluminum and 10 per cent. copper and is at present being fluxed with salammoniac. We are melting in iron pots with no flame touching the metal and it is dipped out and poured with hand ladles at the temperature ranging from 1,325 degrees to 1,400 degrees.

A.—The defects as shown on the sample dome casting used for sweeper are simply depressions of some loose material, it appears to be loose sand. Great care should be taken to clean the mold before closing as every little grain of sand leaves an indelible mark.

Try a few molds by closing the cope over the drag and lifting off again and examine the mold for a crack from the core, whereby loose sand falls in the mold.

Your core should be made from a mixture that will allow the metal to pass into the mold without any agitation. Your metal is not porous so the defect is one of three things—hard core; (2) defective gating; (3) sand or slag getting in the mold. I would suggest you use cloride of zinc for flux and stir well A piece the size of a walnut is enough for a pot of aluminum.—W. J. R. Problem 2,964.

## ALUMINUM SOLUTION

Q.—How can aluminum be electro-deposited?

A.—Aluminum solutions have not been used to any extent. The difficulty appears to be that heavy deposits require considerable time to produce. The following formula gives very good results and if the proportions are increased, it is possible that a fairly heavy deposit may be obtained.

| | |
|---|---|
| Water | 1 gallon |
| Sodium Cyanide 96.98% | 4 ozs. |
| Carbonate of Aluminum | 3 " |
| Carbonate of Ammonia | 1 " |
| Powdered Alum | ½ " |
| Aluminum Chloride | 1 " |

Temperature 120 to 140 degrees Fahr. 4 volts.

The carbonate of aluminum may be prepared by precipitating aluminum sulphate with carbonate of soda; 8 to 12 ozs. of aluminum sulphate will be required. C. H. P. Problem 2,965.

## BATTLESHIP GRAY BRASS

Q.—How can I obtain a finish like that on the enclosed sample?

A.—The sample you have submitted is known as the silver gray brass finish, also termed Battleship Gray Brass.

The color is produced by the aid of antimony, although some firms produce an electro tin as the basis. For antimony prepare a solution of equal parts muriatic acid and water. Heat the mixture to 140 or 160 degrees Fahrenheit, and then add either antimony chloride or the red or yellow sulphide of antimony.

Just add sufficient so that a piece of clean brass, either acid dipped or brushed similar to a brush brass, will become coated with a thin deposit of antimony metal which has a gray lustre.

The mixture can also be used as an electro-deposit, but should be used cold at about 2 volts or less. Anodes may be of carbon, nickel or antimony.

After coloring by the antimony dip or plating as outlined, wash and dry the articles. Then brush down lightly with a brass wire scratch brush and pumice stone and water to give the shaded effect as noted in your sample. Finally lacquer with a fairly heavy brush lacquer.

As noted tin makes a good deposit for this finish. The usual alkaline tin solution should be used.

| | |
|---|---|
| Water | 1 gallon |
| Caustic Soda, 76% | 4 to 8 ozs. |
| Tin Chloride Crystals | 4 to 8 " |
| Gum Arabic or Tragacanth Glue | ¼ to ½ oz. |

C. H. P. Problem 2,966.

## GOLD FULMINATE EXPLOSION

Q.—One of my workmen prepared some chloride of gold precipitating it with aqua ammonia 26 per cent. and he was drying same in a white enamel vessel on a slow fire. While it was quite hot an explosion occurred and no one seemed to know what the real cause was. The white enamel vessel was broken to hundreds of pieces and all the gold (20 dwts.) disappeared entirely. Now I think the ammonia caused the explosion, but to be more sure I would like your advice. Also please send me some directions as how to prepare chloride of gold in the easiest way and not dangerous.

A.—In drying out the gold fulminate, you created a most dangerous explosive. Fulminate of gold when dry, even when moved very slightly, will explode violently.

It is very fortunate that no one met with serious injury. The writer of this answer knows of an instance similar to the one you relate, where the plater had both eyes blown out, due to the drying out of fulminate.

Just so long as the fulminate of gold is kept under water, there is no danger. It is not necessary to use it dry for gold solutions.

The method to pursue is to make up an aqua regia mixture by using 3 parts pure muriatic acid and 1 part pure nitric acid. It will require about eight ounces of the mixture to prepare 1 ounce of gold chloride. Heat part of the total amount of the acid mixture in an evaporating dish by the aid of hot water bath, or heat up sand and put it around the evaporating dish.

Place some of the gold in thin strips in the acid and add more as fast as dissolved. Keep adding the acid also as required. When the gold is all dissolved, add about 1 quart of cold water and mix thoroughly. Then add 26 per cent. ammonia until no further spongy brown precipitate results.

Filter the fulminate of gold from the remaining solution, and wash with clean cold water several times. Following the final washing operation dissolve in a cyanide solution until wanted for use, or keep in an excess of water. There is no danger then.—C. H. P. Problem 2,967.

## RED BRASS DISCOLORATION

Q.—Under separate cover we are forwarding you a sample of red brass borings, the analysis of which is approximately 83 per cent. copper, 4 per cent. tin, 6 per cent. lead, 7 per cent. zinc.

It has developed that when this metal is melted and poured out into castings that the castings show a discoloration. If about one-half new metal is added to this metal the castings come out with their proper color, if run by itself, however, the castings show a very dark color. We will ask you to look into this matter carefully and if you can possibly advise us what factor is present in this metal that would cause this discoloration, and such being the case what treatment will offset this factor, we will appreciate your efforts exceedingly.

A.—The metal in question contains one-quarter of one per cent. of iron. While this amount of iron is not excessive it is capable if not well alloyed, of causing the discoloration mentioned.

Any oil or grease on the borings should be removed by burning and the borings passed through a magnetic separator to remove the iron.

A satisfactory method of combining small amounts of iron that are not removed by the separator, or when no separator is available, and the percentage of iron present is small, is to add 2 or 3 ounces of 15 per cent. phosphor copper to the 100 pounds. This combines the iron, so that it will not oxidize readily and blacken the castings.—J. L. J. Problem 2,968.

Q.—Apparently you have misunderstood the fact that these borings were drilled from ingot metal which was showing the discoloration explained to you. This is not a case where the turnings are being used and showed the defect, but an instance where ingot metal of specified analysis is being used.

The metal appears to be absolutely satisfactory in every way with the exception of the discoloration after the castings are cooled.

To the best of the writer's knowledge and belief, there is no free iron in this metal. The small percentage of iron that same will show is alloyed into the composition.

A.—The surface discoloration of castings is due to a very thin film of oxide that forms on them if they are exposed to the air when hot. Valves and fittings are often taken from the molds very hot and dipped in water to give them an attractive color. If the metal in question has no free iron in it, and it is otherwise absolutely satisfactory as claimed, why worry? The discoloration of the castings is superficial only, and if a nice red color is wanted it can be obtained by dipping while still hot. The sample contained: copper 82.70, zinc 6.64, tin 4.25, lead 6.17, iron .24.—J. L. J. Problem 2,969.

## SCUMMY BRASS SOLUTION

Q.—Could you give me any information on how to overcome a scummy brass solution? The deposit starts alright, but in a few minutes it scums. Such a condition results in much scratch-wheeling.

A.—Arsenic is the very best addition agent you can add to your brass solution to eliminate the muddy or scummy deposit you refer to, but much care must be used in making such additions, as too much arsenic in a brass solution is a detriment.

Before making the arsenic addition, try adding 1 to 2 ounces of bisulphite of soda per gallon to your brass solution. If the bisulphite improves the deposit then add a little more sodium cyanide 96.98 per cent., from ½ to 1 ounce per gallon. This combination should eliminate the muddy deposit.

If not, then prepare an arsenic solution as follows:

| | |
|---|---|
| Hot Water | 8 ounces |
| Caustic Soda | 2 " |
| White Powdered Arsenic | 1 " |

Dissolve the caustic soda in the hot water first, then add the arsenic and mix thoroughly. The solution should be clear.

To 100 gallons of brass solution add two ounces, make an addition of one ounce first and repeat on the second or third batch that you plate, if the brass deposit does not come up bright and clear. However, be very careful in such additions.—C. H. P. Problem 2,972.

## STATUARY BRONZE SOLUTION

Q.—What is a good statuary bronze solution?

A.—The solution for statuary bronze finish on bronze is golden sulphuret of antimony dissolved in water, and used at a temperature of 180 deg. Fahr.

It may also be mixed with ammonia or caustic soda on the following basis.

| | |
|---|---|
| Water | 1 gallon |
| Sulphuret of Antimony | 2 ozs. |
| Ammonia 26% or Caustic Soda | 4 " |

Immerse the articles, scratch brush, dry and repeat if necessary. If the antimony is used in water only, then use water 1 gallon, temperature 180 deg., antimony 4 ounces.

Sulphide of barium also gives an excellent dark chestnut bronze, but the articles must be copper plated.

| | |
|---|---|
| Water | 1 gallon |
| Sulphide Barium | 4 ozs. |
| Temperature 180 deg. Fahr. | |

Immerse until the color becomes a blue black, then scratch, brush dry, lacquer and wax.

Polysulphide can also be used for copper.

| | |
|---|---|
| Water | 1 gallon |
| Temperature 180 deg. Fahr. | |
| Polysulphide | ¼ ounce |

Many bronze finishes at the present time are nothing more than sprayed bronze finishes.—C. H. P. Problem 2,970.

## STATUETTE METAL

Q.—We are commencing to cast statuettes and medals, and our castings are not clean, so please give us what kind of sand or composition we should use for that kind of work.

A.—A good mixture to use for such work as medals, one that will run clean and smooth is:

| | |
|---|---|
| Copper | 58.5 |
| Zinc | 41 |
| Aluminum | .5 |

To make this metal properly care must be taken to use a crucible that has been used only for this mixture. Melt the copper, add the zinc a little at a time, stir after each adding of the zinc, then add the aluminum by forcing it down under the metal with a pair of tongs. In gating use a skim gate like sketch, and use Windsor Lock sand, which can be purchased in barrel lots from any dealer in foundry supplies.

For tablets or statuary work use a mixture:

| | |
|---|---|
| Copper | 90 |
| Tin | 7 |
| Zinc | 2 |
| Lead | 1 |

W. L. R.—Problem 2,971.

## ZINC COLORING

Q.—We are taking the liberty of requesting information in regard to the possibility of galvanized wire, giving it a dark finish, dark greenish color if possible, instead of the ordinary bright finish. We galvanize considerable quantities of fine sizes of wire for weaving purposes and the trade for this material, up to a short time ago, demanded a bright finish on the wire. However, since the development of the electro-galvanizing of wire cloth, after the cloth is woven, which gives a dark greenish finish, the trade is demanding that finish and we find it may be advisable for us to change the finish of our galvanized wire to the dark greenish tint if this can be accomplished. We galvanize the wire by the hot metal process. It occurs to us that this may possibly be accomplished by adding some chemical to the molten metal.

A.—It might interest you to know that the greenish finish upon electro-galvanized wire cloths used in screens is a lacquer, that is applied after the wire cloth is plated and dried. Ordinary gum lacquers slightly tinted with an aniline green gives the greenish tint.

There is nothing you can add to your molten zinc, that will give you this greenish tone. You will have to follow the methods of the wire cloth manufacturers. The zinc would have to be a dead lustre to give the same results.

You could electro-galvanize the wire and coat it with the lacquer and make a continuous process.

As you give the zinc coated wire a slight draw after coating, which gives the lustre, we doubt whether you could get the same results as the wire cloth men do, who plate after the weaving of the steel wire is accomplished, which gives a dead white finish.—C. H. P. Problem 2,973.

# PATENTS

## A REVIEW OF CURRENT PATENTS OF INTEREST

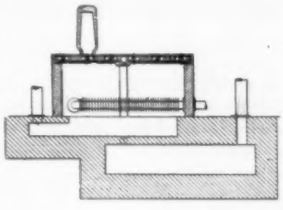
1,373,038. March 29, 1921. **Process of Producing Metal Substances.** Henry C. P. Weber, of Edgewood, Pa.

The invention relates to a process of producing metals which are reducible only with difficulty by the ordinary methods. The process of producing metals and metalloids of the character described, which consists in forming a sublimable compound of the metal substance to be reduced, and reducing such compound by another metallic substance capable of also forming a volatile compound during the reaction.

1,373,724. April 5, 1921. **Forging or Casting with Gripping and Driving Lugs.** Carl G. Heiby, John Burkam, David E. Lindquist, Fred L. Riggin, Ebenezer W. Allen, and Richard Lau, of Sarnia, Ontario, Canada, assignors by mesne assignments, to Mueller Metals Company, of Port Huron, Mich., a corporation of Michigan.

The present invention relates to articles, either forged or cast, and which may be of various shapes, which are subjected to machining or finishing operations, and has for its object to provide convenient gripping and driving means for these articles, in order that the machining and finishing of such articles may be readily accomplished, and, furthermore, that the loss of metal, and the work incident to completing the articles may be very much reduced.

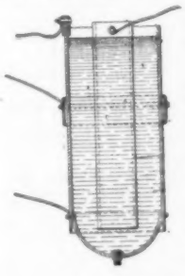
1,373,688. April 5, 1921. **Process and Apparatus for Drying Crucibles.** Louis Vergniaud, of Paris, France, assignor to corporation said: Etablissements Jacob Holtzer.



According to the improved process the external drying of the crucibles is effected by placing the crucibles upon heating tables in a chamber that is constructed specially for the purpose and is maintained at as uniform a temperature as possible.

The crucibles are kept upright on those tables over sets of holes formed therein, in an inverted position such that the rim of the mouth of each crucible resting upon the surface of the table circumscribes and surrounds the whole of its set of holes in an air-tight manner. The size and arrangement of each set of holes are such that the latter allows hot air to circulate systematically inside each crucible from its center to its periphery and thus effect its internal drying.

1,373,488. April 5, 1921. **Plating.** Charles H. Chandler, of Newport, R. I.



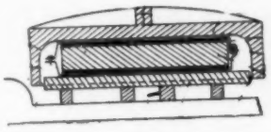
This invention relates to plating and particularly to the depositing from an electrolyte of solder as a coating or skin on metal vessels or other objects subjected by their usage to rust or corrosion. In accordance with this invention, it is possible to deposit solder without separation and with the same successful results as accomplished in depositing lead. Preferably the solder is an alloy of lead and tin. It is therefore possible to line fine solder skin.

or coat extensive surfaces with a smooth

1,379,050. May 24, 1921. **Nickel-Plating. Solution.** Louis Schulte, of Pittsburgh, Pa., assignor to E. I. Du Pont De Nemours and Company, of Wilmington, Del., a corporation of Delaware.

The object of this invention is to provide a solution suitable for the electro-deposition of nickel plate, which solution, although capable of general application, is particularly adapted for depositing nickel upon a highly polished nickel surface.

1,374,110. April 5, 1921. **Welding of Different Metals to Form a Composite Ingot.** Alois Gerard Corneille Pittevil, London, England.

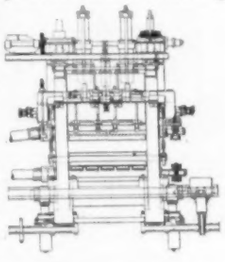


The invention relates to improved means for welding two or more different metals to form a composite ingot, which can be afterward rolled or drawn into sheets, tubes, wires or other forms.

According to the invention, the welding surface or surfaces of a steel or other ingot are first prepared by a milling or other cutting tool, since the process of grinding usually adopted for this purpose does not remove all the impurities or foreign substances present but tends to press them into the substance of the ingot.

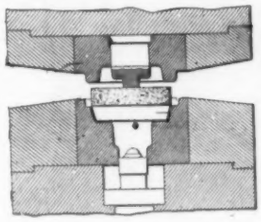
1,373,850. April 5, 1921. **Rolling-Mill.** John S. Worth, of Coatesville, Pennsylvania.

This invention relates to certain improvements in rolling mills, particularly of the type known as a 5-high mill, in which there are two supporting rolls, one above and the other below the working rolls, and an intermediate roll arranged to be shifted to and from either of the working rolls.



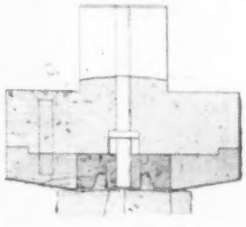
One object of this invention is to provide means for holding the supporting rolls in a central position between the housings.

1,373,726. April 5, 1921. **Method of and Die for Producing Forgings.** Carl G. Heiby, Charles A. Hill, and David E. Lindquist, of Sarnia, Ontario, Canada, assignors by mesne assignments, to Mueller Metals Company, of Port Huron, Michigan, a corporation of Michigan.



The primary object of the invention is to produce from a slug a forging which is of greater length than the length or thickness of the slugs of which the forging is made, the advantage of this being that a slug of relatively large diameter and short length may be utilized to produce forgings of substantially any desired length and form, the construction and action of the dies being such that when the blank is subjected to the action of the forging press the metal will be confined in such a manner as that, flowing along the lines of least resistance, it will be elongated in the axial line of the die, so as to reduce the blank or slug in diameter and give a forged body which has been materially elongated compared to the thickness of the blank.

1,373,725. April 5, 1921. **Method of Producing Forgings.** Carl G. Heiby, John Burkam, David E. Lindquist, Fred L. Riggin, Ebenezer W. Allen, and Richard Lau, of Sarnia, Ontario, Canada, assignors, by mesne assignments, to Mueller Metals Company, of Port Huron, Mich., a corporation of Michigan.



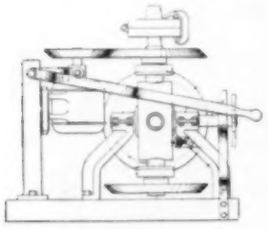
The present invention relates to methods and apparatus for producing forgings from a slug or blank which has been cast as a unit or cut from suitable stock either cast or rolled, which slug or blank has substantially the quantity of metal necessary to the formation of the article, so that the waste in

metal during the finishing operation will be very slight, the forging being substantially in its final form when it leaves the die press.

1,375,930. April 26, 1921. **Process of Treating Brass Scrap.** Oliver C. Ralston, of Niagara Falls, N. Y.

This invention is a novel proces for the treatment of scrap brass and related copper-bearing alloys, the object of the invention being to effect a purification of the scrap, either with or without the coincident conversion of yellow brass into so-called red brass, or other variety relatively high in copper, or even into a residue consisting essentially of copper. According to the present invention, the scrap brass or similar alloy is subjected to the solvent action of cupric chlorid to an extent which is limited according to the particular object in view, whereby certain metals which are electropositive to copper are wholly or partially eliminated, a copper bearing residue remaining, the copper content of which is increased as compared with the original material.

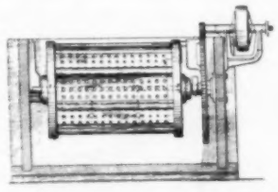
1,376,090. April 26, 1921. **Die-Casting Apparatus.** John L. Gerber, of Pittsburgh, Pa.



This invention has relation to die-casting apparatus, and is designed to provide apparatus of this character, by means of which die castings may be made which are substantially free from blow holes, gas holes and shrinkage cavities.

A further object of this invention is to provide apparatus of this character which is so constructed and arranged as to permit the casting operations to be rapidly performed in sequence in a plurality of die molds.

1,376,052. April 26, 1921. **Cylinder for Electroplating Apparatus and the Like.** Floyd T. Taylor and Wesley F. Hall, of Matawan, N. J., assignors to Munning-Loeb Company, of Matawan, N. J., a corporation of New Jersey.



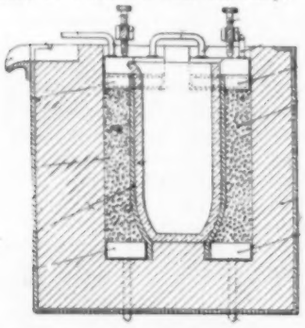
This invention relates to electro-plating and similar apparatus.

One object of this invention is to provide an apparatus of the above character in which the cylinder is so constructed as to cause a positive circulation of the liquid from the interior to the exterior of the cylinder and vice versa.

Another object is to reduce to a minimum the amount of metal readily taken apart.

Another object is to reduce to a minimum the amount of metal used in the construction of the cylinder.

1,375,615. April 19 1921. **Electric Furnace.** Cesare Soncini, of Pont St. Martin, Italy.



This invention relates to electric furnaces and particularly to resistance furnaces adapted for heating and melting materials located within crucibles.

The invention has for its object an improved furnace in which the crucible is heated by means of a plurality of electric resistances which are located adjacent to the crucible, said resistances being independent of each other and adapted to be inserted in the feeding electric circuit in different manners in order to properly adjust the amount of heat developed by them.

1,375,455. April 19, 1921. **Alloy for Electrical Resistance.** Frank F. Hansen, of Chicago, Ill., assignor to Hansen-Halliburton Manufacturing Company, of Chicago, Ill.

This invention relates to improvements in alloy for electrical resistance.

The following proportions have been found to be preferable where the alloy is to be used for the purpose hereinbefore indicated:

| | |
|---|---|
| Chromium | 93% to 95% |
| Tungsten | 2% to 6% |
| Aluminum from | 25% to 1% |

The best proportions, taking into consideration all factors of cost, fusing point, conductivity and length of life, have been found to be:

| | |
|---|---|
| Chromium | 95% |
| Tungsten | 4% |
| Aluminum | 1% |

1,375,454. April 19, 1921. **Electrical-Resistance Alloy.** Frank F. Hansen, of Chicago, Ill., assignor to Hansen-Halliburton Manufacturing Company, of Chicago, Ill.

This invention relates to improvements in electrical resistance alloys.

It has been found that the alloy may be made containing the elements within the limits indicated:

| | |
|---|---|
| Chromium | 30% to 60% |
| Copper | 30% to 60% |
| Tungsten | 2% to 5% |
| Molybdenum | 1% to 3% |

The factors of cost, fusing point, conductivity, length of life, etc., taken into consideration, it has been found that the following approximate percentages give the greatest efficiency:

| | |
|---|---|
| Copper | 50% |
| Chromium | 45% |
| Tungsten | 3% |
| Molybdenum | 2% |

1,375,083. April 19, 1921. **Alloy.** Alvah W. Clement, of Cleveland, Ohio, assignor to the Cleveland Brass Manufacturing Company, of Cleveland, Ohio, a corporation of Ohio.

The alloy herein proposed, in its broadest aspect, comprises an alloy of nickel and molybdenum. Both of these elements in their metallic state have acid resisting properties, and when they are combined as an alloy the resisting properties are enhanced.

1,375,552. April 19, 1921. **Silver-Solder.** William Bocchetti, of Brooklyn, N. Y.

This invention relates to a composition for use in the soldering of silver, and has for an object the provision of a solder with a low melting point which can be used at a temperature which will not melt silver.

The improved composition is composed of the following ingredients substantially in the proportions named:

| | |
|---|---|
| Silver | 59.5% |
| Copper | 25.5% |
| Zinc | 15.0% |

1,375,082. April 19, 1921. **Alloy.** Alvah W. Clement, of Cleveland, Ohio, assignor to the Cleveland Brass Manufacturing Company, of Cleveland, Ohio, a corporation of Ohio.

The alloy herein proposed, in its broadest aspect, comprises an alloy of nickel and molybdenum. Both of these elements in their metallic state have acid resisting properties, and when they are combined as an alloy the resisting properties are enhanced.

1,375,081. April 19, 1921. **Acid-Resisting Alloy.** Alvah W. Clement, of Cleveland, Ohio, assignor to the Cleveland Brass Manufacturing Company, of Cleveland, Ohio, a corporation of Ohio.

The object of this invention is to produce an alloy which is resistant to the action of acids, among which most prominently may be mentioned sulphuric, nitric and hydrochloric.

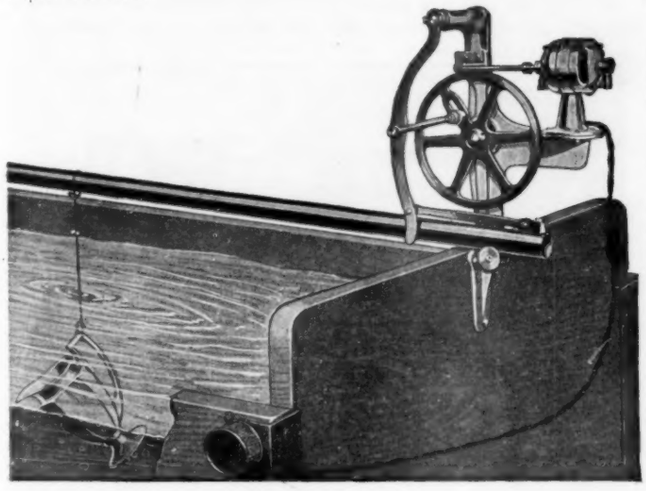
The proposed alloy consists principally of iron, chromium and carbon in the proportion of 40 per cent of chromium, 58 to 59 per cent of iron, and 1 to 2 per cent of carbon, the carbon existing in the alloy in combined form, probably as a carbid of iron and chromium, this carbid being, so to speak, dissolved in the alloy of chromium and iron.

# EQUIPMENT

**NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST**

## AGITATING SOLUTIONS

Many concerns are making a special effort to obtain 100 per cent. platings and very few of them even come close to their goal. Their first trouble is generally with the cleaner. The next difficulty is when the article being plated burns in the solution. Often, small air bubbles form on the object being plated and prevent an even plating deposit, and where die castings are being nickel plated, the various alloys of the castings are sometimes attacked by the sulphuric acid in the nickel solution.



RAUSCH AGITATOR

The Rausch Agitator, together with proper cleaning and plating solutions, it is claimed, overcomes these difficulties. After the article being plated has been properly cleaned, it is agitated in the plating solution by the Rausch Agitator.

This method is said to allow of the full use of the dynamo current and does not give the acid in the solution time to burn or oxidize the article which is being plated.

### SPECIFICATIONS

The Rausch Agitator is operated by a 1½ H. P. motor requiring 115 volts, alternating or direct current 25 to 60 cycles. Any length rod may be used to support the castings which are being plated.

### EQUIPMENT

A rheostat, to regulate the speed of the motor, 10 feet of cord and an extra roller to be used at the opposite end of the tank is the regular equipment.

With each Rausch Agitator are furnished, free of charge, successful cleaning and plating solution formulas that are said to be worth many times more than the cost of the Rausch Agitator. It is sold by the Crown Rheostat and Supply Company, Chicago, Ill.

## NEW CLEANING COMPOUND

Salco Cleaning Compound will, it is claimed, remove grease, oil and dirt without tarnishing the brightest surface on the most delicate metal. It is quick to operate, is absolutely soluble and is said to leave no sediment to pick up on the work or carry into the plating solutions.

Salco is highly recommended by the manufacturer for electro cleaning steel, iron, metal, stamping, screw machine products, wire goods, etc.

Instructions for using Salco Cleaning Compound:

Water—One Gallon;

Salco Cleaning Compound, 4 to 8 ounces;

Keep solution near boiling point.

The Service Department is composed of practical men, headed by S. Herrick and R. A. McIntire, who will assist with plating and cleaning problems. Salco is manufactured by the Salco Chemical Company, Worcester, Massachusetts.

## NEW CLEANER

Kwid-Mild is a mild alkaline cleaner, said to be especially adapted for all polished metals, absolutely free from alkalies and cleanses without oxidation of the polished metal surface. It is recommended by the maker for Gold, Silver, Copper, Bronze, Brass, Zinc, Aluminum and Die-Castings.

Solution—4 to 6 ounces per gallon water. It should be maintained at a temperature of 160-200 degrees Fahrenheit for best results. Strength can be maintained at a normal point by adding small proportions of the cleaner at frequent intervals.

Kwid-Medium is similar to Kwid-Mild, but is slightly more radical in its action, and is said also to be adapted to all metals, polished or unpolished.

Solution—4 to 8 oz. per gallon water. Should be maintained at a temperature of 160-200 degrees Fahrenheit for best results, and maximum temperature should not be exceeded. Strength can be maintained at a normal point by adding small proportions of the cleaner at frequent intervals.

Kwid-Strong, it is claimed is especially adapted for cleasing articles of cast iron or steel that are covered excessively with oil, grease, or polishing materials, that are not readily saponified in the milder type of cleaners.

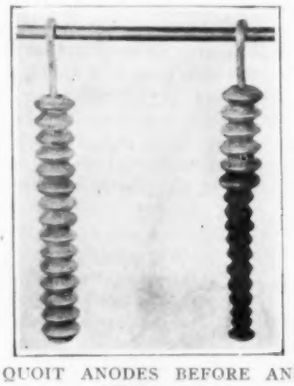
It is strongly recommended for garages, machine shops, and all automatic factory washing machines, and for cleansing by the wet tumbling method for iron and steel parts, or wherever the metal surface to be cleansed holds an excess of oils or greases.

Solution—Should be maintained at a temperature of 180-200 degrees Fahrenheit. Plating Room, Garage, Factory Washing Machines—6 to 8 ounces per gallon water. Wet or Barrel Tumbling Method, use from 2 to 3 ounces per gallon water.

It is advisable to dissolve the portions of cleanser to be used in a small amount of boiling water before adding to the cold water. For every gallon of solution use from one pint to one quart of hot water. The Claxton Sales Corporation of 54 Market Street, Paterson, N. J., who are the distributors state that they are in a position to give expert advice covering the cleansing of all metals and will be pleased to give the benefit of their experience.

## NEW ANODE

A new form of anode for all finishes, except gold and silver, has been placed on the market. This anode, recently patented by Arthur Weeks, of the Oliver Typewriter Company, Woodstock, Ill., is being sold by A. P. Munning & Company, New York, who have the exclusive sales right.



QUOIT ANODES BEFORE AND AFTER USE

The advantages claimed are the elmination of waste; better disintegration, and consequently better replenishment of solution than other types of anodes; it is stated that the quoits will permit of closer grain and sounder castings; better circulation of solution in the tank and uniform wear on the quoits, as illustrated by the illustration; elimination of various lengths of anode castings. Since the upright tube holds the quoits it is only necessary to load the upright with quoits to the level of the solution. It also eliminates the necessity of cast curved anodes for mechanical plating barrels, since the upright can be curved to conform to the cylinder of the barrel.

## ELECTRO RECTIFIER

A new device called the Electro Rectifier for plating purposes has been established in the Occidental Plating Company, at 1001 Polk street, San Francisco, Cal.

It is said to have done away with the motor-generator sets; it supplies from one to a thousand amperes, driven by a ¼-horsepower motor. The polechanger on this device changes the alternating current to direct current from 6-12 volts, cutting the cost of current, it is claimed, one half.

It is also claimed that the machine that is furnished to deliver the same voltage and current has a first cost which is about one-half that of any other machine to deliver a like amount of current, as the regulation is done by using a transformer to give the current and voltage desired thus saving a loss of current in resistance. The largest motor required to deliver a thousand amperes would be one-half horsepower.

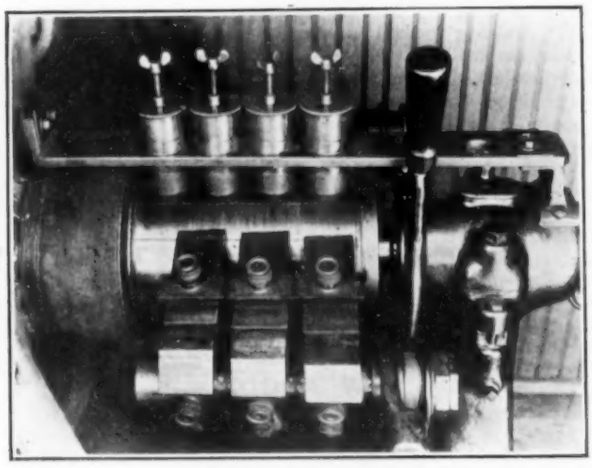
The Electro Rectifier is manufactured by the Electro Rectifier Company, 315 Gillette building, 830 Market street, San Francisco, Cal.

## NEW LUBRICATING BRUSHES

The report of Schweitzer Lubricating Brushes installed on a general electric 3 volt, 600 ampere, direct current generator by Martin A. Vogt, Chicago, Ill., June 7, 1921, reads as follows:

"The use of this type of brush is particularly suitable for low voltage high current generators. The advantages from an installation of this kind are good commutation and long life to the commutator and current carrying brushes.

"It is a known fact that copper or brass gauze brushes will frequently cut the commutator, causing sparking and other



SCHWEITZER LUBRICATOR BRUSHES

troubles. By the application of a thin film of graphite and oil to the commutator at all times, the sparking and cutting will be eliminated providing the brushes are properly set and adjusted to the commutator. The function of the Schweitzer Lubricating Brush is to supply a thin film of graphite and oil to the commutator at all times. It is not a current carrying brush but an addition to the regular set of brushes.

"The Schweitzer Lubricating Brush consists of a hollow brass cylinder to which a cylindrical carbon of the same diameter is permanently attached at one end and a removable cap with a thumb screw adjusting plunger screwed to the other end. A slot centrally located in the carbon and extending into the hollow cylinder allows the compound to be forced out when the plunger is turned to the right.

"Filling of the brush is accomplished by removing the cap and plunger, the hollow space is then filled with compound and the cap screwed on with the plunger in the uppermost position.

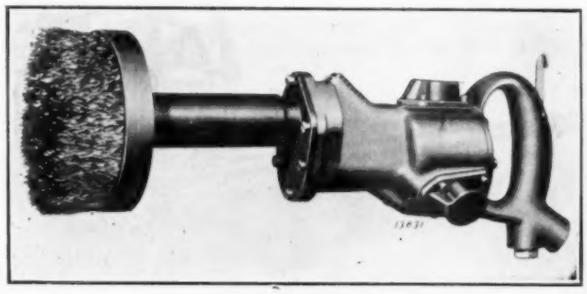
"The accompanying photographs show an installation of lubricating brushes which have been in service for the past eight years. During this period satisfactory service has been rendered, also very little wear noted on the commutator and brushes.

"Previous to the installation of lubricating brushes on this particular machine which is equipped with six copper brushes, considerable difficulty was experienced in keeping the commutator and brushes in good condition. Frequently the machine was taken out of service to have the commutator and brushes redressed. Since the addition of lubricating brushes no further trouble has been experienced."

These brushes are made by the Commonwealth Edison Company, Chicago, Ill.

## NEW WIRE BRUSH CLEANER

Wire brush cleaning of metal surfaces offers an opportunity for considerable saving of time and labor over that required



"LITTLE DAVID" WIRE BRUSH CLEANER

by hand in removing paint, rust, scale and dirt. However, it has been difficult to obtain a wire brush of proper design and materials which would work effectively on an air motor and not wear out too rapidly.

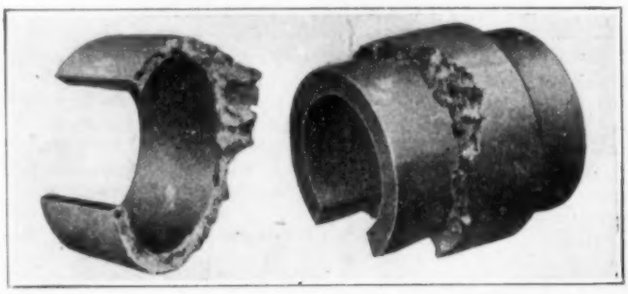
A wire brush of very rugged design has recently been placed on the market by the Ingersoll-Rand Company, 11 Broadway, New York, for use with its standard No. 6 "Little David" Drill. It is a brush with face diameter of 5 inches and is made up of wires of a special heat treated steel which, it is claimed, has very good wearing qualities.

It is manufactured particularly as an attachment for the No. 6 Drill (as illustrated), this type of machine being especially made for work of this nature. The drill has liberal bearings to take up all the end thrust when pressing down on the work; a high speed motor, and moreover is of light weight and small overall dimensions. It is stated that it can be used in sharp corners and other cramped spaces. The whole outfit weighs only 11½ pounds.

The wire brush outfit is said to be adapted for removing paint, rust, scale and dirt from tanks, steel cars, structural steel and all sheet metal surfaces, and to be very useful for cleaning iron, steel and aluminum castings.

## COPPER FLUE POINTS FOR LOCOMOTIVES

Charles S. Coleman, 406 Grosse Building, Los Angeles, Cal., an employee of the Santa Fe Railroad, has designed a copper flue point for locomotive boiler tubes, and has also developed a method of welding the copper flue points to the steel boiler tubes.



BREAKING TEST OF WELDED BRASS FLUE

In Argentine, English locomotives are being used, having copper flues the full length of the boiler. With the Coleman method of welding, copper points two inches long can be welded on an iron flue and by so doing 20 flues of the Coleman style could be installed for the cost of installing one of the copper. It is not necessary to use copper for the entire length of the flue as the leakage is only at the fire box. The Coleman point remedies this leaking at the end and saves the necessity of using the copper the entire length of the flue. This copper point can be used of different lengths, preferably two inches in length. It is said to require about two minutes to make the weld.

The copper point is scarfed about ¾ inch, and it is left slightly larger than the inside diameter of the old flue to which the copper point is to be welded. The end of the flue is then heated until the expansion of the flue is such that it will go on the scarfed end of the copper flue point. Between the end of the old flue and the scarfed section, an opening is left of about one-eighth inch. When the tube is cooled it is shrunk on the copper flue point very tight. When the weld is completed it has the appearance shown in the accompanying cuts. Coleman's method of welding copper or brass on steel, cast iron or iron prevents oxidation of the metals to be welded, thereby producing an even flow and perfect weld. In the accompanying cut are shown samples of his welding and breaking test. This shows a brass flue end welded to a boiler steel tube. The test broke the brass up to the full tensile strength of the brass. The weld remained intact, while the brass end broke under 30,300 pounds strain.

The Coleman copper flue point has a square machined shoulder (shown by the arrows at C. C. C. in the cuts) which fits solid against the inside of the flue plate. This, with the slight bevel of the hole through the flue plate (1 inch to 1 foot) forms a wedge when the tube end is finished, and beaded down. The tube with the square shoulder machined in the tube end and placed solid against the flue plate, prevents the moving of the tube in the plate from either expansion or contraction, hence prevents leaks.

The merit of the Coleman copper flue point, as claimed, lies in the increased thickness of the flue point and in the tapering hole, tapered from the firebox side. When the Coleman flue point is set firmly against the shoulder on the water side of the sheet, and expansion is taking place, the flue is pushing against the shoulder (shown by the arrows at C. C. C.) and not pushing the bead off the sheet on the firebox side. When the tubes are contracting the flue point, instead of pulling against the bead and loosening the flue, is pulling against the tapered hole in the flue sheet and not straining the bead on the firebox side.

Mr. Coleman has also designed a steel flue point similar to the copper flue point, only the shoulder on the steel point rests solid against a copper ferrule, which rests solid against the plate. This, with the slight bevel of the hole through the plate, forms a wedge when the tube end is finished, and beaded down.

# ASSOCIATIONS AND SOCIETIES

## REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

### AMERICAN FOUNDRYMEN'S ASSOCIATION

The executive committee has unanimously adopted a resolution to the effect that the next convention and exhibit should be held in April or May, 1922, at a place to be selected by the convention and exhibits committee.

Printing and binding difficulties have delayed delivery to members of the bound volume of "Transactions" for 1920. The latest advices are that it will be mailed out to members, from Cleveland, during the week of June 27.

### BRASS MANUFACTURERS' ASSOCIATION

The National Association of Brass Manufacturers held a very successful two days' convention at the Iroquois Hotel, Buffalo, N. Y., on June 2 and 3.

Reports were received from the Committee on Standardization, which will be made known later; also, from the Water Works Division of the Standardization Committee, and delegates appointed, headed by President Arthur I. Fischer, to attend the convention of Water Works Superintendents of the American Water Works Association, that is being held in Cleveland during the present week.

Figures submitted indicated that business was about 50 per cent of normal, comparing the first part of this year with that of 1920.

The Metric System came up for discussion, but failed to meet the approval of the delegates and was tabled.

The Trade Extension Bureau came in for its share of praise, and all members, with very few exceptions, reported as contributors to same and on the good work done, all were urged to in the hope that the good and beneficial effect of the example of this association, will be passed on to all people in kindred organizations.

The commissioner was directed to take a referendum vote from all manufacturers and jobbers in the United States and Canada, and from non-members in the water works line, as to their preference in the adoption of the piece or dozen list in the forthcoming official catalog.

Requests were made and acquiesced in by all potteries except one, that the thickness of lavatories at the opening of the faucet hole be not over 1⅛ inch, and a further request that the punchings or holes for basin cocks and wastes be not smaller than 1⅜ inch.

Financial statements were submitted by the commissioner showing a splendid financial condition, and the recent purchase of a number of interest-bearing bonds for the reserve fund.

The following resolution was unanimously adopted:

WHEREAS, a great many, if not the vast majority, of commercial or business organizations are formed and operated on safe, sound and law abiding principles, and for fair and useful purposes, and

WHEREAS, at the time when speedy mobilization of goods for war purposes was an essential factor, our government then found that organization manufacturers were a most useful and helpful agency in the achievement thereof, and if a useful factor in times of war and stress, should be an equally helpful and potential agency in times of peace,

THEREFORE, BE IT RESOLVED, That the National Association of Brass Manufacturers, in convention assembled, respectfully submit for the careful consideration of Secretary of Commerce Hoover the establishment of a bureau within his jurisdiction where all merchants and manufacturers may confer and ascertain what they may do within their legal rights, and

BE IT FURTHUR RESOLVED, That this association, through its proper offices and committees, enlist the aid and assistance of all similar and kindred organizations in the furtherance of the purpose of these resolutions.

And it might not be out of the way for other organizations to follow in the wake of same and take it up in the suggestion and spirit voiced in this resolution, with any organization, civic, social, fraternal, commercial or such other organizations that they may be identified with.

After a busy two days session the convention adjourned to meet next in Cleveland, Ohio, September 14 and 15.—WILLIAM M. WEBSTER, Commissioner.

## AMERICAN ELECTRO-CHEMICAL SOCIETY

At the business meeting of the society held on April 22, a committee, consisting of William Blum, chairman; Hiram Lukens and George B. Hogaboom, was appointed to investigate the possibility of forming a division upon electrode-position to be organized in accordance with the by-law approved by the directors on January 28, 1921.

The purpose of such a division will be to hold meetings in connection with the semi-annual meetings of the society and thereby to encourage the presentation and discussion of papers upon the electroplating, electrotyping, electrorefining and electroanalysis of metals, and the electrode-position of metals for any other purposes.

If a sufficient number of members express their desire to join such a division, its formation will be authorized by the board of directors, and temporary officers will be appointed by them pending an election to be held at the next general meeting. In case the division is formed, it is hoped to secure a sufficient number of appropriate papers to hold the first divisional meeting in the fall of 1921.

Mr. Corse and his committee are making great preparations for the Lake Placid meeting, September 29-October 1. It is suggested that automobilists will find a very pleasant vacation by combining the trip to and from Lake Placid with the meeting. A later bulletin will give details of automobile routes to Lake Placid. It is also suggested that there is not a finer vacation spot in the East than Lake Placid, and that members can get reduced weekly rates if they spend a week or more at the Lake Placid Club. Golf, mountaineering and other sports will make the week pass quickly. Circulars describing the beauties of Lake Placid and the comforts of Lake Placid Club are enclosed.

The technical attractions of the meeting are going to be no less enjoyable than the scenic attractions. Thursday will be taken up with Non-ferrous Metallurgy, Friday with Electrode-position, Saturday, Miscellaneous—and all highly interesting papers.

Lehigh University, Bethlehem, Pa. June 15, 1921. JOSEPH W. RICHARDS, Secretary.

## INDIANAPOLIS BRANCH, A. E. S.

The branch held its regular meeting June 11, with a good attendance. One member was suspended for non-payment of dues. One member mentioned a trouble he had with his hot copper solution made from metal cyanides. The work was absolutely clean when put into the solution, but came out with round spots on it, the spots containing no copper. After several theories were offered, he told what his investigations brought out. He found that the solution contained too much sodium and that his helper ran the temperature too high. By lowering the temperature and diluting the solution the trouble was overcome.

## NEW YORK BRANCH, A. E. S.

President Sterling presided at the May meetings of the New York Branch of the A. E. S. One application for active membership was received and referred to the board of trustees. A general discussion concerning the Indianapolis convention was indulged in. The following are the delegates elected: P. Haddow, J. Sterling, G. Wilson. Alternates, J. Burke, J. A. Stremel and W. Fischer.

The new officers elected for the ensuing year of the New York Branch are: President, J. A. Stremel; vice-president, W. Fischer; secretary-treasurer, E. Haas; recording secretary, P. Morningstar; librarian, J. Burke; sergeant-at-arms, F. S. Stretch; assistant sergeant-at-arms, G. Corrubo. Trustees, J. Sterling, T. Haddow, F. Househelter, W. Voss and D. Popper.

## ENGINEERING STANDARDS COMMITTEE

Standards recently approved by the American Engineering Standards Committee include four copper specifications submitted by the American Society for Testing Materials as "Tentative American Standard," as follows:

9.—1921. Soft or Annealed Copper Wire.
10.—1921. Lake Copper, Wire, Bars, Cakes, Slabs, Billets, Ingots and Ingot Bars.
11.—1921. Electrolytic Copper Wire Bars, Cakes, Slabs, Billets, Ingots and Ingot Bars.
12.—1921. Battery Assay of Copper.

## ELIMINATION OF WASTE REPORT

The American Engineering Council held its bi-monthly meeting of the Executive Committee in St. Louis, July 3, at which a report was made of the investigations which have been going on for the last six months upon the elimination of waste. It was stated that management was responsible for 50 per cent of industrial waste, and that labor could be held accountable for less than 25 per cent. The waste due to unemployment, idle equipment, time and energy lost amounted to millions of dollars per year.

The full report will be published under the authority of the Council, signed by the committee. It will deal with loss caused by low production, interrupted production, and restricted production.

## WASTE MATERIAL DEALERS

The meeting of the Metal Division was held on Thursday, June 23, at 11 A. M., at the Astor Hotel, with H. L. Green presiding. Mr. Milton Lissberger, of the Solder and Babbitt Manufacturers' Association, spoke on the necessity for action on the impending tariff on tin. The meeting passed a resolution to take action in this matter, and also empowered the chairman to appoint a committee to watch tariff developments in the future.

A change in the classifications was voted substituting the words "free of loose dross or lumps of dross" for the words "free of dross" as applied to electrotype shells.

## AMERICAN VALUATION ASSOCIATION

The American Valuation Association, 407 Carbide and Carbon Building, New York, recently organized by a group of eastern manufacturers who have taken the initiative in launching a nation-wide campaign to boost the Fordney tariff measure now pending in Washington, is getting its campaign into swing, according to a statement authorized by Stanley Williamson, secretary of the association.

The organization of the American Valuation Association is advocating strongly the appraisement of imported merchandise on a basis of American values, which they claim is the only practicable means of preventing the dumping of foreign merchandise on the American market.

It is the purpose of the new association, as announced by the executive committee, to take up every phase of both plans and to submit to manufacturers a statement regarding the advantages to be derived by American industry through adopting the American rather than the foreign valuation plan.

The American Valuation Association was formed by a gathering of representative American manufacturers at the Chemists' Club, in New York City, June 16. Walter Camp, president of the New Haven Clock Company, was chosen president of the association at that time. Other officers are:

D. W. Jayne, of the Barrett Company, vice-president; Stanley Williamson, of the Linde Air Products Company, secretary, and F. D. Dodge, of the Toy Manufacturers of the U. S. A., treasurer.

## NATIONAL SAFETY COUNCIL

The Spring meeting was held jointly with the Cleveland Engineering Society in their rooms in the Hotel Statler, Cleveland, on Tuesday, May 31. This was the last meeting before the sessions at the Tenth Annual Safety Congress in Boston during the week of September 26.

## NATIONAL LIME ASSOCIATION

The program of the Third Annual Convention of the National Lime Association held at the Hotel Commodore, New York City, June 15-17, 1921, includes several speakers of international reputation. Information can be obtained from M. E. Holmes, manager of the Chemical Department, 918 G street, N. W., Washington, D. C.

# PERSONALS

## ITEMS OF INDIVIDUAL INTEREST

**William H. Moore,** who until recently was assigned to the Chicago territory of the Metal and Thermit Corporation, now has charge of the Southern territory.

**C. E. Davies** has been chosen to succeed the late **L. G. French** as managing editor of "Mechanical Engineering," the official publication of the American Society of Mechanical Engineers.

**Irving M. Chapman, E. M.,** has become a member of the New York staff of Smith, Brodie and Lunsford, Woolworth building, New York, accountants, as a specialist in engineering and cost work.

**H. W. Wieting,** formerly with Berry Brothers, has become associated with our sales organization. Mr. Wieting will call upon special trade in the industrial field in Connecticut and Massachusetts, with headquarters in South Norwalk, Conn.

**William Aldrich,** who has recently been in charge of Thermit welding in the Southern territory of the Metal and Thermit Corporation, 120 Broadway, New York, has been transferred to the Western territory of the company.

**Chester M. Clark,** formerly head of the corporation department of Stone & Webster, Inc., and during the war secretary of the underlying company at Hog Island and assistant to Matthew Brush, the president of that corporation, has been elected treasurer of Arthur D. Little, Inc.

**Merton R. Sumner** has been appointed chief engineer of Arthur D. Little, Inc., chemists, engineers and managers, Cambridge, Mass. Mr. Summer was formerly chief engineer for New England of Fred T. Ley & Co., Inc., and more recently was chief engineer of the Fuller Industrial Engineering Corporation, a subsidiary of the George A. Fuller Company.

**W. Barton Eddison,** who is associated with the Surface Combustion Company, 366 Gerard avenue, New York, was on April 6, 1921, awarded the Edward Longstreth Medal of the Franklin Institute, for his jet entraining apparatus for proportioning air-gas mixtures as applied to furnace practice. This award was given in consideration of the development of the design of a self-regulating Bunsen burner that has made a decided advance in the art of burning gas in industrial appliances.

## DEATHS

### WILLIAM H. MUSICK

WILLIAM H. MUSICK

William H. Musick, 62 years old, president of the Musick Plating Works, St. Louis, one of the largest job plating plants in the United States, died at his home in St. Louis on June 8. He had been president of the St. Louis branch of the Electro-Platers' Society, and was a member of several lodges and the Rotary Club. He had been in the plating business 42 years, formerly in partnership with M. D. Degge. Death was caused by paralysis. The business will now be conducted by his two sons, Edward J. and George E. Musick.

### FRANK H. WHEELER

Despondency because of prolonged illness and brooding over the death of a business associate are given as the reasons for the action of Frank H. Wheeler, 57 years old, Indianapolis millionaire, who committed suicide yesterday in a bathroom in his home at 147 Riverside Drive. He discharged the contents of both barrels of a shotgun into the left side of his head.

Mr. Wheeler was one of the founders of the Indianapolis Speedway and president of the Wheeler-Schebler Carburetor Company. In addition he was connected with the Stutz Fire Engine Company, was president of the Wheeler-Langsenkamp Brass Company, and was prominently identified with the business interests of Indianapolis. He was born at Manchester, Ia., and located in Indianapolis about twenty years ago. He provided the capital for establishing the manufacturing plant of the carburetor company for Mr. Schebler, the inventor of the carburetor, and the two became partners in business, the company having increased so rapidly until it is now one of the largest manufacturers of gasoline engine carburetors in the country.

Mr. Wheeler was a member of the Scottish Rite and Mystic Shrine, the Columbia Club and the Independent Athletic Club. Besides his widow and son, Douglas Wheeler, vice-president of the carburetor company, his mother and a half-brother survive.

### J. F. BROWN AND R. E. LAMAR

The Hilo Varnish Corporation, Broooklyn, N. Y., has announced with deep sorrow the death of two members of its sales organization, Mr. R. E. Lamar on June 6, and Mr. J. Frank Brown on June 17. Mr. Lamar looked after the dealer trade in Philadelphia and adjacent towns, and Mr. Brown called upon the industrial trade in the Pittsburgh territory.

### WILLIAM ADRIAN JONES

William Adrian Jones, head of the W. A. Jones foundry, of Chicago, died at Laporte, Ind., recently, following a two weeks' illness of diabetes. Mr. Jones, who was a thirty-third degree Mason, was said to be a millionaire. He had a collection of firearms valued at $10,000.

### WILLIAM H. BLOSS

William H. Bloss, aged fifty-two, most of his life a resident of Muncie, Ind., who laid out the first traction line between Muncie and Indianapolis, died June 22 at his home in Mansfield, O. The body was brought to Muncie June 23 for burial. Funeral services were held in the local Masonic temple, June 24. Mr. Bloss was a graduate of Muncie High School and of Purdue University, in the civil engineering course. He was a member of the Ohio Brass Company at Mansfield. His father, John Bloss, for several years was president of the state board of education and long was superintendent of the Muncie city schools. Mr. Bloss is survived by a widow, Mrs. Fay Bloss; two sons, John and Herbert, and a daughter, Virginia.

# TRADE NEWS

## BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

### TORRINGTON, CONN.

JULY 1, 1921.

There has been no appreciable improvement in the situation in the metal industry here since last month. In fact, with the exception of an occasional small order here and there, things are even more quiet than they were a month ago. The shops all are working on greatly curtailed time with reduced working forces, though the more optimistic persons continue to express confidence that by the end of summer things will begin to hum again. Many of the plants are closed down anywhere from a week to a month during July for inventory and repairs. The **Union Hardware** plant closed June 29 and will not reopen until July 25. The **Torrington Branch** of the American Brass Company is closed from July 2 to July 10, the **Hendey Machine** plant for the first two weeks of July, and the **Torrington Manufacturing** plant from June 27 to July 11. The **Fitzgerald Manufacturing Company,** which has been more active than any other concern in town during the dull period, probably will not close for more than a few days during the latter part of July. The Fitzgerald plant is the only one now operating on full time.

Edward Collins, a foreman in the employ of the American Bridge Company, was killed at the Torrington Branch of the American Brass Company last month, when he was caught between a traveling crane and a bridgehead. He was at the plant supervising the installation of electrical equipment in the casting shop. His home was in Lynchburg, Va.

**E. E. MacIntosh,** of Torrington, formerly with the Waterbury Manufacturing Company, is now holding an executive position with the Trumbull, Vanderpool Company of Bantam.

J. H. T.

### NEW BRITAIN, CONN.

JULY 1, 1921.

Although New Britain is still in the deep trough of a serious industrial depression, there will be no general closing of the manufacturing plants in July, according to data obtained from a survey of such concerns completed today for the Metal Industry. Officers of seven big concerns either definitely stated that there would be no further shut-downs, or that no such action was contemplated and it is not likely that it will be. There are modifying circumstances in connection with the closing of one or two of the five plants, planning a one or two weeks shut-down.

Among the factories where officers say there is no indication of a general shut-down are: **The American Hardware Corporation, Stanley Works, Fafnir Bearing Company, New Britain Machine Company** and the **Union Manufacturing Company.** Those which contemplate closing for one or two weeks are: **Hart & Cooley, Landers, Frary & Clark** and the **North & Judd Manufacturing Company.**

C. F. Bennett of the Stanley Works said that the number of orders coming in were reasonable under present conditions, but he was careful to distinguish between what would be a "reasonable number" of orders under ordinary circumstances and the reasonableness of that number under present conditions.

In speaking of the closing of the North & Judd Manufacturing company for two weeks, H. C. Noble stated that there was really nothing unusual about this as they always close down for inventory. Significant at this concern is that at the last meeting of the directors the regular quarterly dividend of 3 per cent. was declared. This brings the total dividends (with extras) paid by the North & Judd Manufacturing company during the year ending July 1, up to 15 per cent.

Business at the Landers, Frary & Clarke company is admittedly dull. The stockrooms are filled to overflowing and sales are slow, one or two big jobbers providing the bulk of the business. However, as soon as business does pick up at all this concern expects to feel the benefits immediately. Effective July 1, prices on a number of standard articles manufactured by this company are being materially reduced.

From a present review however, the best that can be said locally is that business is no worse than it has been. And at the same time there is no reason, founded on fact, to assume that it will pick up greatly within the next month or so.

H. R. J.

### ROCHESTER, N. Y.

JULY 1, 1921.

There is very little of an encouraging nature to report from this city, inasmuch as May and June did not measure up to the expectations of the most optimistic in industrial lines. With the final advent of warm weather the usual period of quietude that prevails in all lines of business is making itself apparent, and from now until September a feeling of summer lethargy will prevail.

No little interest was caused here by the statement of **Charles M. Schwab** to the effect that German optical goods were being sold in Detroit and other centers in competition with American made materials. This statement is of peculiar interest here from the fact that the largest optical works in the world—the **Bausch & Lomb Optical Company**—are located on the banks of the Genesee river in this city.

The German government seized and confiscated the Bausch & Lomb plant in Germany during the war, but that incident merely inspired the Rochester owners to outdo themselves and to outdistance the German optical workers. This they claim to have accomplished, and so far as the German trade bugbear is concerned the Bausch & Lomb concern has no fear for the future whatever. In fact so soon as the economic disturbance in Europe starts toward real adjustment the Bausch & Lomb company will proceed to find markets for its products in every country in Europe, Germany included.

G. B. E.

### PROVIDENCE, R. I.

JULY 1, 1921.

The first six months of 1921 have passed and with them has gone one of the most unsatisfactory periods from a buiness point of view in many years. But the worst feature of it is that in their train they have left an uncertainty and unrestful condition that is far from promising as to the immediate future. The close of June finds many plants and shops in every line of industry shut down, many of which have not been idle before in years. This is particularly true as concerns metal industries, every branch of which is showing the depressing effects of generally poor business conditions.

In the jewelry lines the situation is one of the worst. Few if any plants are operating on even a 50 per cent. basis of normal conditions and what is most discouraging is that there are no prospects to encourage the resumption in the early fall. Not in two generations have the conditions in the jewelry field been so discouraging.

An evidence of the general situation is to be seen in the announcement that has been made by the management of the extensive plant of the **Brown & Sharpe Manufacturing Company;** the entire plant will close July 29 for a period of five weeks. Ordinarily the summer shut-down is limited to two weeks, but this year it will be more than doubled in length. And this, notwithstanding that for several months the place has been operated on short time with only about one-third to one-half the regular complement of workmen. The plant, it is said, will reopen September 6, notices informing the employees of the shut-down having been posted in the several buildings of the plant.

The **A. H. Bliss Company, Inc.,** which was recently incor-

porated under the laws of Rhode Island for the purpose of conducting a manufacturing jewelry business, has organized with Eugene P. Platt as president and treasurer; David H. Butler, vice-president, and Frank H. Hammill as secretary. The company has purchased all the assets of the A. H. Bliss Company, formerly of North Attleboro, Mass., and will continue to specialize in the manufacture of chain at its factory, now located at 136 Hospital street, Providence.

The **Eagle Cornice Company,** S. D. Strauss, manager, 212 Blackston street, has the contract for the sheet metal work on the new large addition to the plant of the Adams Manufacturing Company, North Scituate, R. I.

The **New England Metal Company,** 70 Calverley street, is being conducted by George Samdperil, according to his statement filed at the office of the city clerk.—W. H. M.

## TRENTON, N. J.

JULY 1, 1921.

The plant of the **Mercer Motors Company** has been closed down for several weeks because of the lack of orders and will remain closed until business picks up.

The lock-out of the men employed at the various building trades caused considerable injury to business during the past few weeks and naturally affected the metal market. The master builders informed the men that a new wage scale—reducing the pay from $1 to $2 a day—would go into effect on June 13. The men objected to the cut and were locked out, tying up more than $3,000,000 worth of new building. Finally a mediator was selected and will decide upon a wage scale after hearing the argument of the bosses and each union involved. Some of the mechanics of the nine unions involved received as high as $10 a day.

The **Magna Metal Corporation,** of Newark, N. J., has been incorporated with $12,500,000 capital to manufacture metal products and coloring processes for metals. The officers of the company are: President, Harry F. Hays, Jr., 33 Osborne Terrace, Newark, N. J.; secretary, Irving W. Teeple, 207 Market street, Newark, N. J.; treasurer, Oscar W. Nelson, 227 High street, Newark, N. J.; assistant treasurer, Fred S. Ashley, 709 Sixth avenue, New York City. Besides the above the other officers are Howard C. Matlack, Gano-Moore Company, New York; E. P. H. Allen, 627 Highland avenue, Newark; John Connor, 783 Mount Prospect avenue, Newark. John Connor, Jr., of 80 Chelsea avenue, is the authorized agent in charge.

The **Ferguson-Herbert Corporation,** of Hoboken, N. J., has been incorporated at Trenton with $100,000 capital to deal in metals.

**Klecald Stamping and Refining Company,** of Jersey City, N. J., has been incorporated with $50,000 capital to deal in metal wares.

**E. A. Williams & Son** will erect a brass foundry in Livingston street, Elizabeth. The building will be 35 by 60 feet, one-story and built of steel and hollow tile.

**L. A. Myers, Jr., Inc.,** manufacturers of metal novelties of Newark, N. J., has purchased a large plot of ground adjoining the works to provide space for the future growth of the concern.

**Lauder & Shean Device Manufacturing Company,** of Newark, N. J., has been incorporated at Trenton with $500,000 capital to manufacture metal devices.

**Henry H. Cooperson** and **Leon Cooperson** have formed a business under the name of **Cooperson Brothers** to specialize in radiator repairs and auto sheet metal work. They have leased a large building on North Fourth street, Camden, and have installed equipment for sheet metal work. They have also inaugurated an acetylene welding department.

The **Clifton Can Company,** of Passaic, N. J., has been incorporated at Trenton with $250,000 capital to manufacture cans.

The **Ampere Novelty Manufacturing Company,** of 197 North Sixteenth street, East Orange, N. J., has been organized to manufacture metal specialties.

**American Smelting & Refining Company,** of St. Charles street, Newark, will erect a foundry building to cost $8,000.

**Dahlstrom Metallic Door Company,** of Jamestown, N. J., has removed its New York office from the Consolidated Gas Company to the Cunard building.

Reorganization of the **John A. Roebling's Sons' Company** has been effected with the election of Col. Washington A. Roebling as president to fill the vacancy caused by the death of his nephew, Karl G. Roebling. Mr. Roebling died suddenly on Sunday, May 29, on the grounds of the Spring Lake Country Club.

Colonel Roebling served as vice-president of the John A. Roebling's Sons' Company, while Karl G. Roebling was the active executive head of the great industry. Ferdinand W. Roebling, Jr., who has held the offices of secretary and treasurer of the company, will succeed his uncle as vice-president and will continue in the office of treasurer.

**G. L. Flock, of** 121 Perry street, Trenton, who has opened an establishment for the refinishing of brass beds, chandeliers and other metal articles, is already doing a good business.

C. A. L.

## BALTIMORE, MD.

JULY 1, 1921.

In common with the metal industry throughout the country, Baltimore plants have suffered from the general depression, but the dividend policies of two of the most important plants will offset each other. While the **Baltimore Tube Company** directors have decided to defer action, the directors of the **Eastern Rolling Mills** have declared the regular quarterly dividend of two per cent. on the preferred stock payable July 1 to stockholders of record June 18. The Rolling Mills were shut down for a while a little time back, but later resumed operations on about a seventy-five per cent. basis.

The Baltimore Tube Company has been paying one and three-quarters per cent. regularly up to the end of the last quarter on its $1,250,000 seven per cent. cumulative preferred, but has adopted at this time the policy of many other concerns of conserving its resources, and the directors have sent out to stockholders a letter explaining why this action is advisable.

A marine boiler and repair plant, representing an investment of about $20,000 and employing forty or more men, has been put in operation by **Theodore H. Rhode** at Atlantic Wharf, Boston street and Lakewood avenue.

New machinery will be installed and other improvements made to cost approximately $50,000 by the **Baltimore Valve Company** this summer. A. T. Smith is president of the company.

**Daniel Rinehart**, president of the **Pennsylvania and Atlantic Seaboard Hardware Association, Inc.,** and W. G. Pearce, field service secretary of that organization, were the guests of honor at a dinner given in Baltimore at the City Club June 14. The affair was held under the auspices of the Baltimore Retail Hardware Association. A large number of the members of the latter organization went to the national convention which opened the latter part of June in Louisville, Kentucky.

The **Phelps Can Company,** southeast corner of Fulton avenue and Eagle street, has recently acquired a new factory site. This new plant which will represent a consolidation of their other two plants will use considerable electric service.

The **Liberty Brass Works** have moved to 408 West Redwood street and will soon be ready for business. This concern, whose plant was located at 303 East Lombard street, has discarded all steam equipment and will use only electricity and gas.—W. J. L.

## INDIANAPOLIS, IND.

JULY 1, 1921.

Officials of the quartermaster corps of the U. S. A., stationed at Ft. Benjamin Harrison, recognized the services of the metal workers of Indianapolis recently when they were invited to attend a celebration of the one hundred and forty-sixth anniversary of the quartermaster corps of the United States Army. The men in the trade were invited because of their part during the war. The dinner was one of a

number given in various parts of the world where the quartermaster corps is stationed. State, city and civic officials addressed the dinner, which was one of the largest ever held in this city.

The **Reliance Foundry Company** at Richmond, Ind., has increased its capital stock from $30,000 to $60,000.

The **Indiana Brass Company** of Frankfort, Ind., has increased its capital stock $150,000, all of the increase being preferred stock.—E. B.

## DETROIT, MICH.

JULY 1, 1921.

Detroit manufacturers have made so many predictions, and listened to so many theories, and studied so many forecasts, that they have about made up their minds one man's guess, so far as business conditions are concerned, is just about as good as another. No one knows what the future is going to be—in Detroit at least—no matter how many may think they have the situation well doped out. We are in the midst of a very nasty situation—a situation that has no comparison, and there's just about as much sense in giving credence to a fortune teller's vagaries as there is in pinning faith to any kind of future forecast. Business is dull, and when there's going to be a change for the better, no one knows. "We've just got to grin and bear it," is the general sentiment of the majority of big manufacturers here. At times certain lines seem to take a sudden notion to show slight improvement. Then they hesitate and drop back again. For the last few months the automobile business has been on the upward trend in certain makes, and it probably will continue fair for a time at least.

Here in Detroit, the month just closing has been but little better than the one which preceded it. Manufacturers are buying just as little as possible, and the same might be said of the people in general. Even though conditions are so quiet, there is a general spirit of optimism that is most refreshing and helpful through it all.—F. J. H.

## CLEVELAND, OHIO

JULY 1, 1921.

Metal industry interests in the Northern Ohio territory enter upon one of the most unusual periods in business history with the advent of the summer season; while a majority of the industrial establishments of the district are closed, or partly so, not a few have booked some tremendous orders, the like of which were not exceeded even during that period prior to this country entering the war.

On the other hand probably the most important development of the month comes in the form of a concession granted to the **Defiance Motor Truck Company** by the Chinese government, whereby the local firm will supply all motor trucks and automotive machinery for use in a gigantic plan to modernize the Orient. This is probably the first step in the plan, which calls for the purchase of textiles, locomotives and agricultural implements, all of which will be purchased through a $100,000,000 bond flotation.

Still more new outlets for metal industry activities are seen in the reports that two new plants propose to be established here. The **Automatic Vacuum Bag Company** has been organized to manufacture a metal device to be used in connection with vacuum cleaners. Officers of the company are: President, F. J. Deutsch; vice-president, Edmund Farkas; secretary-treasurer, W. R. Dunzweiler.

At the tenth annual conclave of the metals branch of the **National Hardware Association** of the United States, financial, marketing and manufacturing problems were discussed. More than 200 delegates were present.

Metal industry factors are watching the developments in connection with the plans of metal trades workers to reorganize a council similar to the Building Trades Council in the building industry. The move is said to be preliminary to a campaign among all workers in the metal working plants of the city by the Cleveland Federation of Labor. It is claimed that workers in every branch of the industry will join. Members of the different crafts were affiliated with a council which was disbanded eight months ago.—C. C. C.

## ST. LOUIS, MO.

JULY 1, 1921.

A considerable increase in business is reported by local metal manufacturers during the month of June over the preceding month, and a general confidence is expressed in the future if the present indications of a resumption of normal conditions materialize. An impetus was given to the brass trade recently through the resumption of building on a small scale, and the announcement of plans for several large structures is considered a favorable feature.

A general improvement is noted in the automobile lines, the two St. Louis factories now operating on what will soon become a normal basis. Assembling plants of the larger factories in the East have not increased operations, but little or no trade resulted from their activity when they were operating at capacity. Electrical goods manufacturing is at a very low point at present, several plants producing 50 per cent. or less of their normal of last year. However, the increase in building is expected to improve this situation. The **St. Louis Brass Company** are pushing their line of fixtures and lighting units by an extensive national distribution campaign and a large amount of national advertising. Barber supplies, machinery and virtually all lines are still being made in small quantities to fill orders on hand, it is reported.

The **More-Jones Brass & Metal Company** have received some large orders including bank fixture jobs and quantity castings during the month.

Local stove plants report an increase in operations for the month, production being gaged on an anticipated fall and winter trade. Polishers in the stove plants as well as in the job plating plants have accepted a 15 per cent. reduction in wages, following similar cuts made in other trades. The rate for polishers now is 76½ cents an hour, with a 48 hour week prevailing.

Nineteen job platers of the city will go to the convention of the **American Electro-platers Society** to be held in Indianapolis. Arrangements are being made for a private car to carry the delegation from St. Louis and Belleville and Illinois towns adjacent to St. Louis.

**Edward Musick**, proprietor of the **Musick Plating Works** since the death of his father, on June 8, reports a normal business, and an increase in the accessories line. Mr. Musick has a complete library at the plant for use of members of the society of which he is a former president. The library included bound volumes of THE METAL INDUSTRY since 1911.

W. G. R.

## LOUISVILLE, KY.

JULY 1, 1921.

The situation this month in Louisville is not good, the majority of copperworking shops being at a standstill, some of them being down entirely for the time being, and others working along with a force that has to be looked for in entering the shop.

Some of the smaller shops which do general metal plating and finishing have been getting a little business this year on refinishing bright parts for old automobiles, which are being renewed, but there is very little factory work being placed by auto or parts manufacturers.

The **Independent Brass Works**, Louisville, reports that business is quiet, but that its castings are on about a 65 per cent. basis. The company has just recently secured some good Government orders for bronze insignia for use by the army and navy.

The **Vendome Copper & Brass Works**, according to E. E. Sherman, is at a standstill, the shops being down entirely at the present time, while its boiler and sheet metal department is merely dragging along, and the aluminum department hasn't enough business to be in the busy class.

The copper and brass shops of **Hines & Ritchey** are operating on a very slow bell just now, and most of the work that is being turned out is for the company's allied concern, the Standard Milk Machinery Company, which has been getting a fair volume of business in Florida and the far South.

The works of **Matt Corcoran & Company** are operating with a reduced force, and merely going along on a few small

orders. Following the summer season, however, the company anticipates better fall business.

Prices of material are way down, but labor continues very high on the contracts signed last year. It is claimed that until copperworkers are willing to accept less money it is going to be a hard matter to increase business materially, in spite of the big drops in metal.—A. W. W.

## BIRMINGHAM, ENGLAND

JUNE 15, 1921.

The metal industries were in a better position than were many other trades to withstand the coal stoppage. The large use now made of electricity for power, and of gas for both power and heating helped them greatly. With working hours curtailed by the falling off in trade due to other causes, the supply of fuel gave less cause for anxiety. But now stocks are almost everywhere exhausted. Two of the largest non-ferrous rolling and tube mills are closed indefinitely and others are nearing that point. The public gas supply in Birmingham, already rationed to 50 per cent. of the normal for industrial purposes, has been cut off during the afternoon and further reductions are foreshadowed. The Electric Supply authority is making a similar curtailment with the result that many small firms are closing. Other towns are even worse off with regard to gas and electricity. Many plants have been converted to use crude oil as fuel for steam raising and metallurgical work.

Wages in the brass trade, in accordance with the agreement made a month ago, have been further reduced as the result of a reduction in the cost of living as shown by the index figures of the Ministry of Labor. The total reduction for men is now 5/10½ per week of 47 hours with proportionate reductions for youths under 21 years of age.

**W. J. Davis,** the general secretary of the National Brass Workers and Metal Mechanics Society, is retiring after fifty years' almost continuous service, being now 73 years of age. He took the lead in the formation of the Society in 1871 and became its secretary. In 1883, for about six years he became a government inspector of factories, but at the end of that time, at the urgent request of the brassworkers, he resumed the secretaryship which he has held ever since. The trade, owing to his tact in negotiations, has been troubled with very few industrial disputes.

In the brass trade, the only departments anything like fully employed are those dealing with water fitting. The jewelry trade is slacker than ever. Employers in the Sheffield silver trade, owing to shortness of orders and the impossibility of meeting competition, have proposed a reduction of 12½ per cent. in wages. On a ballot the Unions refused this and the employers gave their workpeople four weeks' notice to terminate their engagements. Some six thousand employees, including silversmiths and Britannia metalworkers, are affected. Reductions of wages have already been accepted in London and Birmingham.

The **Birmingham Metallurgical Society** will have for president during the next twelve months, **F. Johnson,** M. Sc., head of the metallurgical department of the Birmingham Municipal School. Mr. Johnson has contributed a number of important papers on metal subjects to the Institute of Metals and other technical societies.—W. H. G.

## MONTREAL, CANADA

JULY 1, 1921.

Business is still rather slow in all lines of metal manufacturing in Montreal and the surrounding territory. Local members of the trade report inquiries and orders light at present, but they are most optimistic over the future. Building operations in this part of the country are increasing every week, and it has taken on quite a boom this month. The jobs are of large size, and most of the hardware, plumbing and electrical metal products going into the jobs are of the finest.

With production in all lines of manufacturing far below normal and a boom in all kinds of business this fall is expected. Naturally that the metal trades will receive their share of this prosperity.

The **British-American Nickel Corporation, Ltd.,** has definitely carried through its refinancing scheme according to announcement. The corporation's capital is now arranged for as follows: $6,000,000 first income bonds, $18,000,000 second income bonds and $20,000,000 common stock. The corporation which has temporarily shut down its plants is waiting for the right time to resume operations. The corporation's mine and smelter plants at Sudbury and its refinery at Duchesne, Quebec, are of the most modern and adequate construction, and have a capacity of up to 10,000 tons of nickel per year.

The **Lymburner Brass Manufacturing Company,** are now making a full line of fire apparatus and report increasing sales for their goods.

The copper refinery of the **Consolidated Mining and Smelting Company** has been increased to fifty tons daily capacity, which is approximately the total Canadian consumption of refined copper. Both ingot and sheet copper are being turned out and wire bars will be a regular product when the copper rod mill now nearing completion begins operations. The rod mill has a daily capacity of 150 tons of wire rods. This will insure a full supply for Canadan wire drawers. The company will not embark on the production of wire, the field being fully occupied by the four Canadian companies.

—P. W. B.

## VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The **Attwood Brass Works,** Grand Rapids, Mich., recently was incorporated for $100,000 by C. F. Attwood, C. E. Attwood, L. E. Attwood and H. Cook.

The **Globe Brass Foundry Company,** 54 John street, Albany, has started a foundry for making brass, bronze and aluminum castings of light and medium weight.

The plant of the **Kenney Manufacturing Company,** Auburn, R. I., was recently damaged by fire. This company manufactures brass rods, and operates a tool room and plating and lacquering departments.

The **Lebanon Brass Manufacturing Company,** Lebanon, Pa., has just completed the erection of an addition which several times increases their capacity. The concern operates a brass, bronze and aluminum foundry.

The **Ladel Manufacturing Company,** New Philadelphia, Ohio, has placed a contract for the erection of a steel and brick machine shop and foundry, 88 x 307 feet. This firm operates a tool room and grinding room.

The **Oklahoma Pattern Works,** Oklahoma City, Okla., plans the erection of a new plant building; and will change its name to the Oklahoma Pattern and Brass Works. This company operates a brass, bronze and aluminum foundry and brass machine shop.

The **Metallic Manufacturing Company,** Collins, Wis., has filed articles of incorporation with a capital stock of $50,000 to manufacture metal office furniture and metal window screens. C. G. Hallberg is president, and Emil H. Waak secretary and treasurer.

The **Ferguson Maunfacturing Company, Ltd.,** London, Ont., has been incorporated with $40,000 capital stock, to manufacture conduit pipe fittings and covers, by Charles H. Ivey, Samuel E. Weir and John C. Elliott. They operate galvanizing and lacquering departments.

The **U. T. Hungerford Brass and Copper Company,** 80 Lafayette street, New York, have created a "metal specialties" department to take care of the large amount of business which they are doing in turned, spun, stamped, cast and drawn work and special parts of all descriptions.

The **Beagle Hame Company,** Freeland, Pa., is manufacturing the hames of Hoch Hame Company, whose works

were destroyed by fire, which occurred very recently.

A small fire in the plant of the **Southern Brass Works, Inc.,** Portsmouth, Va., recently caused damage of $200.

The **Pittsburgh Purchasing Agents' Association** held their fourth annual picnic at the "Pines," near Pittsburgh, on Saturday, June 18. They also took a trip to Youngstown, on which about 125 purchasing agents from the Pittsburgh district were the guests of the General Fireproofing Company and the Republic Rubber Company.

The **Usona Manufacturing Company,** 826 South Eighteenth street, St. Louis, Mo., manufacturer of electrical equipment, will take bids until June 23 for a new one and two-story factory on Chateau street, 100 x 150 feet, and estimated to cost about $75,000 with equipment. F. C. Lanz is president. This firm does ornamental iron, wire, brass and bronze work for building. They have a plating and polishing department.

The **Durabilt Steel Locker Company,** 800 Arnold avenue, Aurora, Ill., has been incorporated with a capital of $100,000 to manufacture an improved and simplified steel locker with exclusive features on which patents are pending. Their factory is under construction and machinery is being purchased. Production will start about July 15. They will operate a tool room, stamping and japanning departments, and do shearing and forming of sheets, spot welding, and riveting.

The **Armstrong Cork and Insulation Company,** Pittsburgh, Pa., have made the following changes in their branch office addresses: Cincinnati, Ohio, removed from 1808 First National Bank building to 1015 Broadway; P. E. Thomas, manager. Boston, Mass., removed from 84 North street to Columbia street (Station 11); F. W. Robinson is manager, succeeding A. L. Dorr. Kansas City, Mo., address changed to 529 Lee building instead of 529 Reserve Bank building.

The **Frank C. Fellows Company,** Boston, Mass., manufacturer of brass, bronze and other metal products, has acquired the Androscoggin foundry at Auburn, Me., for the manufacture of its products. A one-story addition will be erected. The company has acquired the plant and business of the Skowhegan Brass and Iron Foundry, Skowhegan, Me., which it will remove to the Auburn works. It operates a brass, bronze and aluminum foundry.

**Israel Brothers Iron and Metal Company** and the **Dayton Bronze Bearing Company** have purchased the buildings of the Platt Iron Works, at the corner of Keowee and Valley streets, Dayton, Ohio, for approximately $225,000. The Dayton Bronze Bearing Company plans to manufacture brass and aluminum castings in a portion of the newly acquired buildings. The part of the property not used by them is being held pending the decision of an eastern manufacturing concern to establish a branch factory there. This company operates a brass, bronze and aluminum foundry and brass machine shop.

The **Springfield Bronze Company**, Springfield, Mass., has been incorporated with a capital of $50,000 to manufacture bronze and brass products. They will manufacture high-grade non-ferrous castings, and will make a specialty of bearing metals and aluminum alloys. Their foundry is in the course of construction and they expect to be producing in about three months. Joseph R. Gould, 135 Ohio avenue, West Springfield, is president and treasurer and Robert S. Kneeland and Leonard Johnston, who is the foundry superintendent, are directors. They will operate a brass, bronze and aluminum foundry.

The **Magnetic Manufacturing Company,** Milwaukee, Wis., expect to begin operating their new plant in the early part of July. They expect to operate such departments as a machine shop, coil winding department, electrical department, sheet metal department, pattern shop and assembling department. R. H. Stearns is president and treasurer of this company, and J. P. Bethke secretary.

An order has been entered by the United States District Court for the Northern District of Ohio, Eastern Division, notifying all creditors of the **U. S. Copper Products Corporation,** 3511 Ridge Road, S. W., Cleveland, Ohio, that they may file claims with Frank S. Loeb, receiver, at the office of the company on or before July 16, 1921. In default of the filing and proof of claims within the time stated the creditors shall be debarred from participation in any dividend or distribution of assets.

## VIOLIN OF ALUMINUM

David D. Abramowitz, director of the Wolcott Conservatory of Music of Denver, recently purchased a violin made of aluminum. It is patterned after one of the Stradivarius models and possesses a tone of unusually good quality. Mr. Abramowitz considers this violin a rare possession, both from a tonal and material side, and maintains that the experiment if such, is highly successful.

As to the general future use of such an instrument made of metal, this authority states that the "Strad" has held its ground for ages past, and will continue to defy modern makers who would discover the secret of the beloved "Antonio."—Denver News.

## INTERNATIONAL NICKEL REPORT

The report of the International Nickel Company for the year ended March 31 shows a surplus, after charges and taxes, amounting to $2,029,700, after deducting preferred dividends, is equal to 89c. a share on the outstanding common stock. In the previous year the company showed a surplus of $2,745,734, or $1.32 a share. At the close of the fiscal year the company's plants were running 20 per cent of capacity.

## LARGE COPPER WIRE ORDER

Placing of an order for 10,000,000 pounds of copper wire by the Pacific Gas and Electric Company, of San Francisco, was announced June 7. It was said to be the largest single order for copper wire ever made.

The wire will be shipped from Black Eagle, Mont., it was said, and will require 270 railroad cars for transit.—N. Y. Times.

## LOWER COPPER FREIGHT RATES

Newark manufacturers using copper and lead will be able to get the metals from points in New Mexico and Arizona at a freight reduction of $20 a ton. The Southern Pacific Company announced June 9 that the new rate of $16.50 a ton will become effective on July 15.—Newark, N. J., Ledger.

## JAPANESE ALUMINUM PLANT

A new method of extracting aluminum from a certain mineral, which affects the future development of Japanese industry and the formulation of an established air policy of the Japanese government, is the result of the investigations on the production of aluminum and its compounds. A great refinery plant driven by electric power will be established at Yoyogi. A project is under contemplation to establish a semi-governmental company for the manufacture of aluminum by the new method, which consists in the electrical analysis of ore by Korean alum and other materials and enables the production of more than 99 per cent of aluminum.—N. Y. Commercial.

## INDIAN ALUMINUM PLANT

A plan is under consideration for the construction of a plant on the western coast of India to produce about 2,500 tons a year of aluminium from bauxite by the use of electricity. It is proposed to generate about 20,000 kilowatts by the construction of a large reservoir to collect and store the annual rainfall and the flow of a small stream, with a head of about 1,700 feet. Considerable quantities of aluminium are now being imported for the manufacture of cooking and other utensils, and it is thought that there will be a good market for the product and demand for any surplus power generated.—N. Y. Times.

## JOHN FRITZ MEDAL AWARD

A deputation of representatives from the American founder societies attended the awarding of the John Fritz medal to Sir Robert Hadfield at the opening meeting of the Institution of Civil Engineers in London, June 29.

## TRADE PUBLICATIONS

**Mack Double Plunger Locks.**—A folder issued by Carl Mack, 239 Flushing avenue, Long Island City, N. Y.

**Crescent Brand Brass Pipe.**—A folder issued by the Wheeler Condenser and Engineering Company, Carteret, N. J.

**Research Narratives No. 11. Total Reflection by Animalcules.**—A folder issued by the Engineering Foundation, 29 West 39th street, New York.

**The Point of Perfection.**—A circular issued by the Electrical Alloy Company, Morristown, N. Y., on their Magno Ignition Metal for spark plugs.

**What Good Is the Hole in a Spark Plug.**—A folder issued by the Bodin Spark Plug Company, Allentown, Pa., describing their "BZ" spark plug.

**Research Narratives No. 10. Nitrogen—Its Capture and Utilization.**—A folder issued by the Engineering Foundation, 29 West 39th street, New York.

**The American Electric Cleaner.**—A folder issued by the Wise-McClung Company, New Philadelphia, Ohio, describing their electric vacuum cleaner.

**Time Is Money.**—A folder issued by the Stein and Ellbogen Company, 31 North State street, Chicago, Ill., describing and illustrating their time study watches.

**New Enamel Formula.**—A circular issued by Eugen Wuerz, 158 East 124th street, New York, announcing a new enamel, which he has just put on the market.

**Baird Machinery.**—A catalog issued by the Baird Machine Company, Bridgeport, Conn., describing tumbling barrels and other machinery which they manufacture.

**Electric Traveling Grab-Bucket Cranes.**—Bulletin No. 520-B, issued by the Northern Engineering Works, Detroit, Mich., illustrating and describing these cranes.

**How to Cut a Belt.**—Bulletin No. 14, issued by the Foundry Equipment Manufacturers' Association, describing and illustrating the correct manner to cut and join a belt.

**Inco Insulite.**—Bulletin No. 208, issued by the International Paint Corporation, 13th and Southern Railway, St. Louis, Mo., describing their black insulating varnish.

**Sand-Blasting Work Before Grinding.**—A blotter on which is a reprint of an article on the advantages of sand-blasting, issued by the Pangborn Corporation, Hagerstown, Md.

**4.3 Times as Much Work.**—A folder issued by the Bias Buff and Wheel Company, 8 West 40th street, New York, giving facts and figures of tests between the "Bias" and other buffs.

## METAL STOCK MARKET QUOTATIONS

| | Par | Bid | Asked |
|---|---|---|---|
| Aluminum Company of America | $100 | $450 | $550 |
| American Brass | 100 | 155 | 165 |
| American Hardware Corp. | 100 | ... | 132 |
| Bristol Brass | 25 | 15 | 18 |
| International Nickel, Com. | 25 | 13¾ | 14 |
| Internationa Nickel, pfd. | 100 | 84 | 90 |
| International Silver, com. | 100 | 30 | 40 |
| International Silver, pfd. | 100 | 90 | ... |
| New Jersey Zinc | 100 | 110 | 113 |
| Rome Brass & Copper | 100 | 110 | 130 |
| Scoville Mfg. Co. | 100 | 280 | 310 |
| Yale & Towne Mfg. Co. | ... | 230 | 240 |

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

## METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

### COPPER

July 1, 1921.

A decidedly improved tone, at the close of June, was developed in copper by the immediate prospect of larger export sales and more interest being shown by domestic consumers. Prices of electrolytic, which earlier in the month, had broken ½c. to ⅝c. per pound for the various positions, were ⅛c. higher. Small producers were asking 12.75c. delivered for spot, 12.87½c. for July and 13c. delivered for August shipment. The largest producers, however, were unwilling to shade 13c. delivered, for nearby shipment and were asking ⅛ to ¼c. more for third quarter shipment. In the outside market electrolytic was available at 12.62½c. f. o. b. refinery for prompt and July and at 12.87½c. for third quarter shipments. These prices show a net decline of ½ to ⅝c. per pound for the month. Lake copper, which had sold down to 12.75c. delivered during the month, was steadier at 13c. delivered for early shipment. Casting copper had dropped from 12.50c. at the beginning of the month to 11.75c. producers' works, late in the month, but at the close was slightly firmer at 11.87½c. Volume of business done throughout the month was disappointing, on both domestic and foreign account, it being estimated that total sales were not more than 40 million pounds, of which only 10 million pounds were for export. Statistically, however, the situation was improved, it being estimated that producers' surplus was decreased about 30 million pounds during the month, deliveries into domestic and foreign consumption exceeding output by this amount. Exports were about 30 million pounds and deliveries into domestic consumption about 40 million pounds. Output of refined copper in June is estimated 40 million pounds, of which about 10 million pounds were derived from foreign material.

### TIN

Fluctuations in prices of tin during June were violent, covering a range of 2.50c. per pound on spot Straits and 99 per cent. tin, and 2.25c. on American pure, the result being a net decline of those amounts. The opening, Straits 31.50c., American pure 31.25c. and 99 per cent. ton 30.50c. was at a decline from May closing levels. The lowest and closing price of Straits was 29c.; of 99 per cent. metal 28c., while American pure, after the lowest, 28.87½c. per pound, at the close had recovered ⅛c to 29c. per pound. Arrivals during June were again small although slightly larger than receipts in May, the total in June being 1,565 tons. Deliveries into consumption were 1,590 tons while stocks, June 30, amounted to 2,021 tons, in addition to which there were 525 tons landing. The Fordney tariff bill, pending enactment, places a duty of 2c. per pound upon tin in bars, blocks or pigs, on grained or granulated and scrap tin. Under the existing tariff laws tin was admitted free of duty. The proposed duty, as yet, has failed to arouse any buying interest on the part of consumers, the market being very quiet and dull.

### LEAD

While the market for lead was not so dull as for other metals in June, business done was less in volume than usual. Prices in both markets declined, the leading interest making three reductions amounting to a net of 60 points; 25 points June 6, 25 points June 10, and 10 points June 22, which carried to 4.40c. East St. Louis and New York from 5.00c. East St. Louis, and New York, at the beginning of the month. Outside market prices, June 1, were 4.70c. East St. Louis, 5.00c. New York. A decline began June 2, continuing at intervals until end of first fortnight, when there was a halt in the downward trend. Heavy arrivals of Spanish lead, however, were reported on June 21, and prices in both markets immediately declined to the lowest levels of the month, outside quotations being 4.10c. East St. Louis, 4.30-4.35c. New York, the leading interest quoting 4.40c. East St. Louis and New York. The Spanish arrivals, however, were not offered for sale at such low levels and there was a quick recovery in outside prices, the closing being 4.20-4.25c. East St. Louis, 4.45c. New York for prompt, early and August. Thus, there was a net decline of about ½c. per pound in the outside market.

### ZINC

With galvanizing interests and brass manufacturers, the principal consumers of zinc, doing almost nothing in the way of new business, it was to be expected that zinc prices would further decline in June, but it was scarcely expected that the reduction would carry to the lowest of record since 1908. After the opening at 4.70c. East St. Louis, 5.20c. New York, the decline was continuous at intervals until the last week when it was of daily occurrence, with quotations on June 30, 4.20-4.25c. East St. Louis, 4.70-4.75c. New York, for prompt and early

primary spelter. August shipments were available at a premium of five points. The net decline in June was 45 points as compared with a 30 points decline in May.

### ALUMINUM

Like all other metals in June, aluminum was exceedingly dull. Prices were unchanged throughout the month at the closing May levels in both markets. Quotations of the Aluminum Co. of America were nominally 28.50c. for 99 per cent. and purer; 28c. for 98-99 per cent. virgin; 27.30c. No. 12 alloy and 42.60c. sheet 18ga., all in 15-ton lots f. o. b. producer's plant. Outside prices, also, were merely nominal, quotations being 22.50-23.00c. for 98-99 per cent. virgin; 20.00-20.50c. for 98-99 per cent. remelted; and 18.00-19.00c. for No. 12 remelted. The feature of interest, is the pending Fordney tariff bill which places a duty of 5c. per pound on aluminum, aluminum scrap and alloys of any kind in which the component material of chief value is aluminum. Plates, sheet, bars, rods, circles, discs, blanks, strips, rectangles and squares will be taxed 9c. per pound. The existing, or Underwood tariff, is 2c. per pound on alluminum alloys, crude and scrap; 3½c. per pound on plates, sheet, bars and rods.

### ANTIMONY

Continued heavy arrivals of antimony during June, in the absence of demand carried prices to 4.75c. duty paid New York for spot carloads, this being the lowest level of record as far back as 1903. The new tariff in the permanent bill pending final enactment is 1½c. per pound on regulus or metal. Antimony ore and needle or liquidated antimony are on the free list. According to the tariff enacted in 1913, metal and regulus were taxed 10 per cent. ad valorem, ore being free.

### SILVER

The highest level for bar silver of foreign origin, in June, was 59⅞c. per ounce on the 20th, the lowest level 57⅛c. on June 6-9. While the total range amounted to 2½c. per ounce, the net result of fluctuations from the opening, 57¾c. to the closing, 59c, was an advance of 1¼c. per ounce. Domestic silver, of course, was stationary at 99¼c. per ounce delivered Denver mint. Purchases made in June by the U. S. Government carried the total bought under the Pittman act to 59,481,697 ounces, on June 17. The coinage of silver dollars by the United States, after a lapse of seven years was resumed on June 20, to replace those melted and exported in a wartime emergency to help Great Britain stabilize currency in the Far East. Exports of silver in May, 1921, were $2,852,609 as compared with $2,318,823 in April. Imports in May were $6,956,077 as compared with $3,299,752 in April.

### QUICKSILVER

Quicksilver prices ranged downward from $48 to $46 per flask throughout the month, closing at $46-47 on June 30, the market being in a very quiet condition. The new tariff pending on quicksilver is 7c. per pound, provided that flasks, bottles or other vessels in which quicksilver is imported shall be subject to same rate of duty as if imported empty. New types of quicksilver will be taxed 15 per centum. The rate under the Underwood tariff is 10 per cent. ad valorem.

### PLATINUM

The June market for platinum showed no change from the dulness affecting all metals and prices throughout the month were quoted $72-75 per troy ounce for pure, the level that has prevailed since it was established in April. In the new tariff bill, platinum is exempt as in the Underwood bill.

### OLD METALS

The June old metals market was disappointing. The improved demand noted during May was not continued into June except for coppers and even for these, there was a lagging and prices began to sag by end of first week. By beginning of second fortnight, the whole list was weaker and pessimism as to the future prevailed because of the existing general business depression. By end of the month, not an item had escaped price cutting but the market remained practically stagnant. Old sheet aluminum suffered the heaviest decline, 2c. per pound to 8.50c.; old cast, old clippings and clean borings and turnings each were off 1½c. to 9c., 11.50c. and 4c. respectively. Coppers were off 1¼c. each on strictly crucibled to 9.25c. and uncrucibled to 8.50c. Light copper was down 1¼c. to 7c. One cent declines were, heavy brass to 4.25c., No. 1 brass turnings to 4c., No. 1 composition turnings to 6c., cocks and faucets to 5.75c. heavy lead to 3.25c., block tin pipe to 23c., and pure tin foil to 17c. per pound; ¾c. per pound declines were, new brass clippings to 5.25c., tea lead to 2.25c. and clean red car boxes to 6.50c. Other items were off ½c. to ⅞c. per pound. A factor of importance in further depressing prices in June, was the active campaign inaugurated for the sale of French Government scrap in American markets.

## JUNE MOVEMENTS IN METALS

| | Highest | Lowest | Average |
|---|---|---|---|
| Copper: | | | |
| Lake | 13.25 | 12.75 | 12.957 |
| Electrolytic | 13.12½ | 12.50 | 12.562 |
| Casting | 12.50 | 11.75 | 11.812 |
| Tin | 31.50 | 29.00 | 29.563 |
| Lead | 5.05 | 4.40 | 4.643 |
| Zinc (brass special) St. Louis | 4.80 | 4.30 | 4.57 |
| Antimony | 5.20 | 4.75 | 5.061 |
| Aluminum | 23.00 | 22.50 | 22.75 |
| Quicksilver (per flask) | 48.00 | 46.00 | 46.886 |
| Silver (cts. per oz.) Foreign | 59.87½ | 57.37½ | 58.51 |

## WATERBURY AVERAGE

Lake Copper.—Average for 1920, 18.06—January, 1921, 13.75—February, 13.50—March, 12.625—April, 12.75—May, 13.125—June, 13.125.

Brass Mill Zinc—Average for 1920, 8.33—January, 1921, 6.05—February, 5.50—March, 5.25—April, 5.20—May, 5.30—June, 5.00.

# Metal Prices, July 6, 1921

## NEW METALS

**Open Market**

| | Cents |
|---|---|
| COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. | |
| Manufactured 5 per centum. | |
| Electrolytic, carload lots, delivered | 12¾-13c. |
| Lake, carload lots, delivered | 13c. |
| Casting, carload lots, delivered | 12c. |
| TIN—Duty free. | |
| Straits, carload lots | 29¼ |
| LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots | 4.50 |
| ZINC—Duty 15%. | |
| Brass Special | 4.85-4.90 |
| Prime Western, carload lots | 4.75-4.80 |
| ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb. | |
| Small lots, f. o. b. factory | .... |
| 100-lb. f. o. b. factory | .... |
| Ton lots, f. o. b. factory | 22½-28½ |
| ANTIMONY—Duty 10%. | |
| Cookson's, Hallet's or American | Nominal |
| Chinese, Japanese, Wah Chang WCC, brand spot | 4.75 |
| NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%. | |
| Ingot | 41.00 |
| Shot | 41.00 |
| Electrolytic | 44.00 |
| MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained | 0.75 |
| MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots) | $1.25-$1.35 |
| BISMUTH—Duty free | 1.50-1.55 |
| CADIUM—Duty free | 1.10 |
| CHROMIUM METAL—95-98% Cr., per lb. Cr. contained | 1.50 |
| COBALT—97% pure | Nominal 4.00 |
| QUICKSILVER—Duty 10% per flask of 75 pounds | 46-47 |
| PLATINUM—Duty free, per ounce | 72.00-75.00 |
| SILVER—Government assay—Duty free, per ounce | .99¼ |
| GOLD—Duty free, per ounce | 20.67 |